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† In marine separate.

CORRECTIONS

MONTHLY WEATHER REVIEW:

September, 1915, page 491: Southern Plateau—mean precipitation published as "0.19" should be "0.90." Likewise, Northern Slope—precipitation departure published as "—" should be "+."

November, 1915, page 583: Ohio Valley & Tennessee—precipitation departure published as "−0.4" should be "+0.4."

November, 1917, page 567: Ohio Valley & Tennessee—precipitation departure published as "−0.3" should be "−2.7."

February, 1916, page 57, second column, line 16ffg., for the expression as printed, read "$p_1 p_2 \ldots\ldots p_n$" This expression assumes that z is very small with respect to n.

Do., page 58, first column, last paragraph for "631" read "606."

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CLIMATOLOGICAL DATA FOR THE WEST INDIAN ISLANDS

By W. W. REED

[Prepared under the direction of the Chief of Climatological Division, Weather Bureau, Washington, D. C.]

The meteorological data for this region are found in publications such as the Jamaica Weather Report, containing records for entire island areas, in the *in extenso* reports issued by important observatories such as *Colegio de Belen* at Habana and *Montserrat* at Cienfuegos, Cuba, in *Annales du Bureau Central Météorologique de France. Meteorologische Zeitschrift, Quarterly Journal of the Royal Meteorological Society* (London), *Monthly Weather Review*, and in numerous current bulletins from stations such as Prospect, Bermuda, and Richmond Hill, Grenada.

All sources of information available at the Weather Bureau have been examined and additional data have been sought through correspondence, with a view to presenting as fully as possible the meteorological conditions prevailing in this region.

In the section beginning on page 139, "Climatic conditions in the several islands or groups of islands," meteorological data more or less complete are given for the following areas:

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[a] Northern Leeward Islands.
[b] Dutch West Indies, Southern Group.
[c] Virgin Islands.

The mean values for some stations are based on observations extending over rather short periods. However, since the climate is tropical or tropical-marine in almost all of the region it may be assumed that the temperature values are close approximations to true normals. The precipitation means based on records of 20 years or more may be considered as close approximations to normal values; for those based on 10 to 20 years the approximations are more or less close, depending on the period of record, while those obtained from less than 10 years are very probably to be viewed only as indicating the annual march of precipitation and, when compared with the values from the longer records, as representing in a general way the distribution of rainfall over a given area. The means for other elements, such as relative humidity, cloudiness, etc., can be assumed to be representative even when based on relatively meagre data. The extent of the series of observations is, of course, very important in regard to indications given by records of extremes; the values for stations with long records are good indices as to extreme range over a considerable area.

Throughout this paper temperatures are expressed in degrees Fahrenheit (°F.).

GENERAL CONDITIONS

Before taking up the detailed discussion of meteorological conditions on the separate islands it will be well to give a brief general description of their topographical features and a general survey of the climate of the region.

The West Indies lie between latitudes 10° and 25° north and between longitudes 60° and 85° west. They are grouped in the following divisions: Bahama Islands; the Greater Antilles, including Cuba, Haiti, Porto Rico, and Jamaica; the Lesser Antilles, including the Leeward Islands and Windward Islands; and islands off the middle coast of Venezuela.

Arranged in order of magnitude the areas in square miles are: Cuba, 45,000; Haiti, 28,000; Jamaica, 4,200, Porto Rico, 3,600; Trinidad, 1,700; Guadeloupe, 700; Martinique, 400; Dominica, 300; St. Lucia, 200; Curaçao; 200.

Nearly all of these islands are mountainous and some are very rugged. The elevations of land are of extreme importance in the control of distribution of rainfall in this trade-wind region. The following elevations in feet taken in connection with the limited extent of the land, the cross section in the direction of prevailing wind being only 25 to 50 miles for the largest islands, will indicate the abruptness of the slopes: Cuba, Organ Mountains (west), 2,500; Sierra Maestra (east), 8,300; Haiti, Loma Tina (near Santo Domingo), 10,300; Porto Rico, El Yunque, 3,750; Jamaica, Blue Mountain Peak, 7,360; St. Croix, Mount Eagle, 1,156; St. Kitts, Mount Misery,

3,770; Guadeloupe, La Soufriere, 4,900; Martinique, Mont Pele, 4,430; Dominica, Morne Diablotin, 5,315; St. Lucia, Les Pitons, 2,700; St. Vincent, Soufriere Volcano, 3,500; Barbados, Mount Hillaby, 1,100; Grenada, Mount Catharine, 2,700; Trinidad, Tucuche Peak, 3,100 feet.

INFLUENCE OF TOPOGRAPHY ON CLIMATE IN THE WEST INDIES

The mountainous character of this region affords excellent opportunity to study changes of temperature with elevation in the tropics. Table 1 gives mean annual temperatures at different elevations in Porto Rico and Jamaica.

The influence of the mountains on the distribution of precipitation also is set forth very strikingly in the contrasting amounts of mean annual precipitation for windward and leeward exposures on most of the islands. Table 2 shows the distribution in a northeast-southwest cross section of 50 miles from San Juan to Ponce in Porto Rico and in one of 25 miles from Port Antonio to Kingston in Jamaica.

TABLE 1.—*Change in mean annual temperature with elevation in Porto Rico and Jamaica*

Station	Elevation, in feet	Mean annual temperature, ° F.	Station	Elevation, in feet	Mean annual temperature, ° F.
Porto Rico			*Jamaica*		
San Juan	100	77.9	Kingston	24	79.6
Comerio Falls	500	76.3	Hope Gardens	668	77.3
Cayey	1,350	72.9	Stony Hill	1,400	74.4
Toro Negro Dam	2,275	68.8	Hill Gardens	4,900	62.2

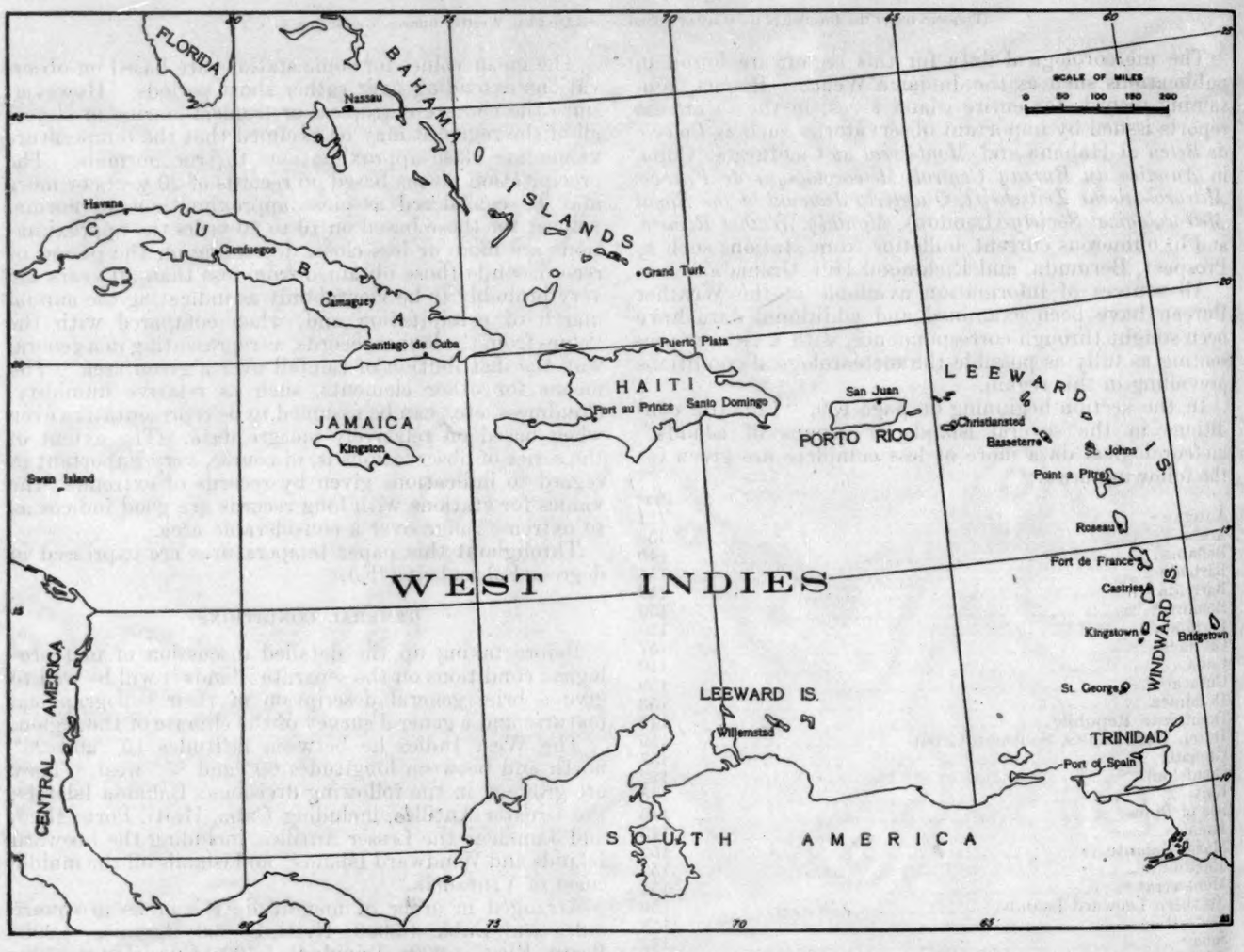


TABLE 2.—*Precipitation in cross section, Porto Rico and Jamaica*

Station	Elevation, in feet	Mean annual precipitation, in inches	Station	Elevation, in feet	Mean annual precipitation, in inches
Porto Rico			*Jamaica*		
San Juan	100	61	Port Antonio		137
Toro Negro Dam	2,275	93	Mooretown		222
Ponce	80	35	Kingston	24	94

CHIEF FEATURES OF CLIMATE IN THE WEST INDIAN REGIO

Temperature.—The mean annual temperature at or near sea level lies between 77.5° and 79.5° over almost the entire region; though at Nassau and Habana we find 76.9° and 75°, respectively, and at a few stations the values are in excess of 80°; Swan Island, 80.5°; Port au Prince, Haiti, 80.7°; and Willemstad, Curacao, 81.0°. At Toro Negro Dam, Porto Rico (2,275 feet), the annual mean is slightly below 70° (68.8°), and at Hill Gardens, Jamaica (4,900 feet), it is only slightly above 60° (62.2°).

The highest monthly mean temperature at stations in the northern part of this region occurs in July or August; the highest for stations from Martinique southward generally in September. For low elevations the maximum monthly means are generally 81° or 82°, with extremes of 78° (Camajuani, Cuba) and 84° (Port au Prince, Haiti); for the 1,500-foot level they fall to about 75°, and for the 4,900-foot level there is a further fall to 65°.

The minimum monthly means are found almost without exception in January or February; near sea level the values are as a rule 75° to 77°, with extremes of 68° (Camajuani) and 79° (Willemstad); while for the two higher levels mentioned above they are about 70° and 60°, respectively.

The mean annual range of temperature is 8° to 11° in the Bahamas and Cuba, about 5° to 7° in other islands of the Greater Antillean group, and still less in the Lesser Antilles, with minimum values about 3° at Bridgetown, Barbados, and Port of Spain, Trinidad.

While maximum temperatures of 100° or over have been recorded at some of the stations (extreme, 104° at Pinar del Rio, Cuba), the highest observed readings do not exceed 95° at many of the low stations and fall below 90° for the higher elevations (Hill Gardens, 88°). In the Greater Antilles the minimum temperatures recorded near sea level range for the greater part between 60° and 50°; in the remainder of the area at the same levels generally between 65° and 60°. The lowest temperatures observed in the West Indies did not occur at the elevated stations of Toro Negro Damor Hill Gardens (minima 46° and 44°, respectively), but at Moron (38°) and Camajuani (40°), both at low elevations, a few miles inland from the middle portion of the northern coast of Cuba.

Table 3 contains data on mean annual temperature, highest and lowest monthly means, mean annual range of temperature, and extreme temperatures for a number of selected stations for which the complete tabulated data follow in the discussion of the several islands. The stations are divided into two groups—those near sea level and those having elevations of 500 feet or more. The mean temperatures are derived by the formula (max. + min.) ÷ 2, chosen because means of daily extremes are available for practically all of the stations, while means according to other formulas, such as (7 a. + 2 p. + 9 p.) ÷ 3 can be had for only a few.

TABLE 3.—*Mean and extreme temperatures (° F.) West Indian Islands* [a]

Stations	Length of record, years	Elevation, feet	Mean annual temperature	Mean temperature warmest month	Month	Mean temperature coolest month	Month	Mean annual range of temperature	Highest temperature	Lowest temperature
AT ELEVATIONS OF LESS THAN 500 FEET										
Prospect 1[c] (*Bermuda Is.*)	24	151	69.8	79.4	Aug.	61.8	Feb.	17.6	94	39
Nassau 2 (*Bahama Is.*)	15	12	76.9	82.4	Aug.	71.3	Jan.	11.1	94	51
Grand Turk 3 (*Turks I.*)	9	12	79.1	83.0	Aug.	75.0	Jan.	8.0	92	60
Cuba										
Pinar del Rio 4	20	180	77.6	82.8	July	71.4	Jan.	11.4	104	46
Habana 4	21	161	75.0	79.5	Aug.	69.8	Jan.	9.7	95	50
Nueva Gerona 4	9	200	77.8	81.9	July	71.8	Feb.	10.1	102	50
Cienfuegos 5, "Montserrat"[b]	11	98	76.2	80.6	Aug.	71.2	Feb.	9.4	93	45
Camajuani 4	16	325	73.5	78.4	Aug.	67.6	Jan.	10.8	99	40
Camaguey 4	13	344	77.4	81.6	*July	71.6	Jan.	10.0	102	45
Preston 4	10	16	77.7	81.2	Aug.	73.6	Jan.	7.6	102	50
Santiago de Cuba 4	16	118	78.9	82.2	Aug.	75.1	Feb.	7.1	97	55
Jamaica										
Kingston 6	16	24	79.6	82.0	Aug.	76.8	Feb.	5.2	98	57
Morant Point 6	16	8	79.6	82.2	Aug.	77.2	*Feb.	5.0	92	57
Negril Point 6	16	33	78.5	80.4	*July	75.8	Feb.	4.6	94	57
Haiti										
Cape Haitien 7	7	49	77.1	80.6	*Aug.	73.0	Feb.	7.6	92	57
Cayes 7	13	23	78.2	80.4	Aug.	75.6	Feb.	4.8	99	59
Gonaives 7	4	10	80.7	83.1	July	77.9	Feb.	5.2	100	58
Port au Prince 7	20	121	80.7	84.0	July	78.0	Jan.	6.0	100	59
Dominican Republic										
Puerto Plata 7	1 3	40	77.9	81.4	Aug.	74.2	Feb.	7.2	94	59
Santo Domingo 8	5	60	78.2	80.6	Aug.	75.2	*Jan.	5.4	95	57
Porto Rico										
San Juan 9	25	100	77.9	80.4	*Aug.	74.9	Jan.	5.5	94	62
Arecibo 9	21	75	77.9	80.6	*Aug.	74.3	Jan.	6.3	101	52
Humacao 9	18	100	77.2	80.2	Aug.	73.7	Jan.	6.5	98	52
Mayaguez 9	24	80	77.0	79.3	Sept.	74.2	*Jan.	5.1	99	51
Ponce 9	19	80	78.6	81.5	Aug.	75.2	*Jan.	6.3	96	55
Virgin Islands										
Charlotte Amalie 10	7	27	79.9	82.9	Aug.	77.0	Jan.	5.9	92	67
Christiansted 11	17	82	79.3	81.8	*Aug.	76.3	Feb.	5.5	96	64
Basseterre 12 (*St. Kitts*)	13	29	78.9	81.4	Aug.	76.2	*Feb.	5.2	92	64
St. Johns 13 (*Antigua*)	11	80	79.5	82.0	Aug.	76.8	Feb.	5.2	93	60
Point a Pitre 14 (*Guadeloupe*)	6	15	78.6	81.7	July	74.6	Feb.	7.1	90	61
Roseau 15 (*Dominica*)	6	25	80.0	82.2	Sept.	77.2	Feb.	5.0	97	63
Fort de France 16 (*Martinique*)	15	13	78.8	80.6	Sept.	76.2	*Jan.	4.4	93	59
Castries 17 (*St. Lucia*)	4	319	78.5	80.4	Sept.	75.9	Jan.	4.5	93	66
Kingstown 18 (*St. Vincent*)	3	80	79.0	81.0	Sept.	77.0	*Jan.	4.0	91	64
Bridgetown 19 (*Barbados*)	5	30	79.6	81.0	Aug.	77.6	Feb.	3.4	90	65
Trinidad										
Port of Spain, 20 U. S. W. B.	8	40	79.6	80.8	Sept.	78.1	Jan.	2.7	95	66
Port of Spain, 21 St. Clair.	20	67	77.6	79.0	May	75.8	Jan.	3.2	101	56
Willemstad 22 (*Curacao*)	15	75	81.0	83.0	Sept.	78.8	Jan.	4.2	94	67
Swan Island 23	7	35	80.5	82.2	*May	77.8	Jan.	4.4	92	64

(See footnotes at end of table.)

TABLE 3.—*Mean and extreme temperatures (° F.) West Indian Islands* [a]

Stations	Length of record, years	Elevation, feet	Mean annual temperature	Mean temperature warmest month	Month	Mean temperature coolest month	Month	Mean annual range of temperature	Highest temperature	Lowest temperature
AT ELEVATIONS OF 500 FEET OR MORE										
Comerio Falls [9] (*Porto Rico*)	18	500	76.3	79.1	Sept.	72.6	Jan.	6.5	99	50
St. George [24] (*Grenada*)	12	509	78.9	80.4	Sept.	77.1	Jan.	3.3	93	68
Hope Gardens [6] (*Jamaica*)	16	668	77.3	80.2	July	74.4	Feb.	5.8	97	55
Petion Ville [7] (*Haiti*)	11	1,312	76.4	79.4	July	73.4	Jan.	6.0	97	54
Cayey [9] (*Porto Rico*)	19	1,350	72.9	76.1	Aug.	69.0	Jan.	7.1	94	44
Stony Hill [6] (*Jamaica*)	16	1,400	74.4	77.0	July	71.9	Feb.	5.1	93	54
Morne des Cadets [25] (*Martinique*)	9	1,676	74.0	76.5	Sept.	71.0	Feb.	5.5	90	59
Camp Jacob [26] (*Guadeloupe*)	10	1,750	72.2	74.8	Aug.	68.8	Feb.	6.0	87	56
Toro Negro Dam [9] (*Porto Rico*)	9	2,275	68.8	72.7	Aug.	65.9	Feb.	6.8	87	46
Hill Gardens [6] (*Jamaica*)	16	4,900	62.2	65.2	July	59.2	Feb.	6.0	80	44

[a] The Bermuda Islands do not form part of this group, but since they are not far distant from the northern Bahamas the data for Prospect are included, but not considered in the foregoing text.
[b] Means from readings at 6 a. m. and 2 p. m.
[c] Also in another month; see complete table for station.

In the following notes the period of record embraces the period from the first to the last year of the series of observations whether continuous or broken.
1. Meteorological observations taken at Prospect, Bermuda, appearing for a time as supplement to the Bermuda Colonist and Daily News. Period 1899–1923.
2. Quarterly Journal of the Royal Meteorological Society (London), January, 1921. Period 1905–1919.
3. U. S. Weather Bureau records. Period 1916–1924; series 1900–1908 not included.
4. Boletin Oficial de la Secretaria de la Agricultura, Comercio y Trabajo, Servicio meteorologico, Habana. Period 1899–1920.
5. Anales del Observatorio del Colegio Ntra. Sra. de Montserrat, Cienfuegos. Period 1911–1921.
6. Jamaica Weather Report, Kingston. Period 1908–1923.
7. Bulletin Semestriel de l'Observatoire Météorologique du Séminaire-College St. Martial, Port au Prince. Period 1906–1921.
8. Annales du Bureau Central Météorologique de France, Paris. Period 1910–1914.
9. Climatology of Porto Rico (advance copy). U. S. Weather Bureau, San Juan. Period 1899–1923.
10. U. S. Weather Bureau records. Period 1917–1924.
11. Meteorologisk Aarbog, Danske Meteorologiske Institut. Period 1900–1917; series 1876–1899 not included.
12. U. S. Weather Bureau records. Period 1899–1924 (broken series); series 1892–1898 not included.
13. Meteorological Summary, Government Laboratory, St. Johns, Antigua. Period 1910–1920; series 1890–1900 not included.
14. Annales du Bureau Central Météorologique de France, Météorologie générale, 1885. Period 1879–1884.
15. U. S. Weather Bureau records. Period 1917–1924.
16. Annales du Bureau Central Météorologique de France. Period 1900–1914.
17. U. S. Weather Bureau records. Period 1918–1921.
18. Meteorological Return, Experiment Station, St. Vincent. Period 1920–1922.
19. U. S. Weather Bureau records. Period 1899–1903.
20. U. S. Weather Bureau records. Period 1916–1924.
21. Meteorological Return, Trinidad. Period 1901–1921.
22. Encyclopaedia van Nederlandsch West Indie. Period 1898–1912.
23. U. S. Weather Bureau records. Period 1917–1924.
24. Meteorological Report, Grenada. Period 1910–1921.
25. Annales du Bureau Central Météorologique de France. Period 1906–1914.
26. Annales du Bureau Central Météorologique de France, Mémoires, 1901. Period 1891–1900.

Relative humidity.—In his paper on the Climate of Cuba (in Proceedings of the Second Pan American Scientific Congress, Vol. II, p. 132) Mariano Gutierrez-Lanza gives the daily march of relative humidity at Habana. The following table contains these data with the addition of interpolations in parentheses.

TABLE 4.—*Daily march of relative humidity at Habana (Belen College)*

Hour	Per cent	Hour	Per cent	Hour	Per cent
1 a. m.	(83)	9 a. m.	(72)	5 p. m.	(69)
2 a. m.	(84)	10 a. m.	66	6 p. m.	72
3 a. m.	(85)	11 a. m.	(64)	7 p. m.	(75)
4 a. m.	86	12 noon	63	8 p. m.	77
5 a. m.	(86)	1 p. m.	(63)	9 p. m.	(79)
6 a. m.	86	2 p. m.	64	10 p. m.	80
7 a. m.	(82)	3 p. m.	(65)	11 p. m.	(81)
8 a. m.	78	4 p. m.	66	12 p. m.	(82)

Mean, 75.

Assuming that the interpolations are admissible as approximately correct and that the march of humidity does not vary to any large degree in the West Indies, it appears that the means derived by the formulas (8 a.+8 p) ÷ 2, (7 a.+1 p.+9 p.) ÷ 3, and (7 a.+3 p.) ÷ 2 (those mostly used), give fairly accurate values for the mean of 24 hours.

According to the records available, there is considerable difference in mean annual relative humidity at sea level between stations with windward and leeward exposure, as follows: 79 per cent at San Juan and 76 per cent at Habana in contrast to 73 per cent at Kingston and 69 per cent at Port au Prince. The lowest relative humidity occurs generally in March or April, when precipitation is still light and temperatures have risen considerably from the minima of the preceding months; the highest relative humidity is usually found in October or November, at the time of maximum precipitation. The range in monthly means of relative humidity is between 63 per cent and 76 per cent at Port au Prince, 71 per cent and 78 per cent at Kingston, 72 per cent and 80 per cent at Habana, and 76 per cent and 80 per cent at San Juan.

Cloudiness.—The means for cloudiness at the different stations are determined from a varying number of observations at different hours. From these data the mean annual cloudiness is found to be between 4.5 and 6.0, without marked change from the maximum in May or June to the minimum in the period from December to March.

Precipitation.—In the West Indies there are remarkable differences in the amounts of rainfall received on windward and leeward exposures and in low and elevated regions; the contrasts are, of course, especially great between high windward and low leeward stations. Table 5 contains the most interesting examples of extreme conditions relative to mean annual rainfall.

Most of these sharp contrasts are between stations separated by only a few miles; the greatest difference, that of 190 inches between Mooretown and Kingston in Jamaica, occurs within a distance of only 30 miles. The most striking example of great difference in precipitation within a few miles is found in Dominica. Roseau, on the western coast, at an elevation of 25 feet, has a mean annual precipitation of 78 inches, while Shawford, about 3 miles to the northeast, at an elevation of 560 feet, has a mean annual amount of 185 inches.

TABLE 5.—*Extremes of mean annual precipitation in different islands (or divisions)*

Island (division)	Greatest annual mean (in inches)	Station	Least annual mean (in inches)	Station
Jamaica	222	Mooretown	32	Kingston.
Haiti	103	Mirebalais	20	Mole St. Nicolas.
Dominican Republic	78	Sanchez	21	Azua.
Porto Rico	93	Toro Negro Dam	36	Ponce.
Guadeloupe	156	Camp Jacob	57	Celcour.
Dominica	185	Shawford	70	Batalie.
St. Lucia	130	Uplyme	49	Moule a Chique.
Grenada	147	Grand Etang	39	Point Saline.
Trinidad	112	Sangre Grande	56	Port of Spain.

For the entire West Indian region the extremes of mean annual precipitation are 222 inches at Mooretown, Jamaica, and 17 inches at Oranjestad, on the small island of Aruba, off the Venezuelan coast. The accompanying table gives monthly and annual means for these stations.

TABLE 6.—*Mean precipitation (in inches). Mooretown, Jamaica, and Oranjestad, Aruba*

Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Mooretown	24	17.48	12.92	9.78	11.76	18.97	21.77	17.72	15.54	15.39	19.92	34.65	26.08	221.98
Oranjestad	24	2.01	0.58	0.66	0.64	0.38	0.53	0.97	1.03	1.28	2.92	3.43	2.98	17.41
Difference		15.47	12.34	9.12	11.12	18.59	21.24	16.75	14.51	14.11	17.00	31.22	23.10	204.57

There is very little uniformity as to the month of maximum or minimum rainfall, not only for different parts of the territory as a whole but also for different regions of individual islands. The greatest monthly amounts are generally received during the period from July to November and the least amounts from January to April. In nearly all of the islands the greatest monthly amounts are above 10 inches and at some stations they reach 20 and even 30 or more inches, while, on the other hand, the lowest monthly means fall below 1 inch.

Table 7 gives for selected stations the mean annual precipitation (in inches), the highest and lowest monthly means, and the range in mean monthly precipitation. The stations have been selected to show the differences in mean annual precipitation where these are considerable on the several islands.

TABLE 7.—*Mean annual precipitation, highest and lowest monthly means and range in monthly means (in inches)*

Stations	Length of record, years	Mean annual precipitation	Highest monthly mean	Month	Lowest monthly mean	Month	Range of mean monthly precipitation
Prospect 27 (*Bermuda Is.*)	55	57.80	5.95	Oct.	4.10	Apr.	1.85
Nassau 2 (*Bahama Is.*)	56	50.99	7.54	Sept.	1.49	Dec.	6.05
Grand Turk 28 (*Turks I.*)	40	28.65	4.51	Nov.	1.11	Mar.	3.40
Cuba							
Cienfuegos, 5 "Montserrat"	11	38.75	5.82	June	0.69	Jan.	5.13
Habana 29	25	43.00	6.21	Oct.	1.33	Feb.	4.88
Santiago de Cuba 29	21	43.79	7.40	Oct.	0.87	Feb.	6.53
Camaguey 29	20	56.07	10.52	June	1.40	Feb.	9.12
Pinar del Río 29	25	61.78	10.65	Sept.	1.39	Dec.	9.26
Nueva Gerona 29	13	70.68	11.96	June	1.47	Jan.	10.49
Jamaica							
Kingston 30 *	53	32.52	6.96	Oct.	0.67	Feb.	6.29
St. Anns Bay 30	28	60.75	10.13	Nov.	2.85	Mar.	7.28
Balaclava 30	27	81.53	12.78	May	1.94	Jan.	10.84
Hill Gardens 30	49	105.48	17.20	Oct.	3.64	July	13.56
Shrewsbury 30	23	166.50	30.70	Nov.	8.52	Mar.	22.18
Mooretown 30	24	221.98	34.65	Nov.	9.78	Mar.	24.87
Haiti							
Mole St. Nicolas 7	17	19.79	2.78	•Sept.	0.94	•Apr.	1.84
Gonaives 7	20	20.21	3.85	June	0.25	Jan.	3.60
Ganthier 7	24	32.15	5.59	May	0.59	Jan.	5.00
Port au Prince 7 *	44	55.03	9.42	May	1.15	Jan.	8.27
Cayes 7	16	83.94	13.71	Oct.	3.34	Jan.	10.37
Mirebalais 7	10	103.11	15.66	Sept.	0.68	Jan.	14.98
Dominican Republic							
Azua 31	6	21.03	3.86	May	0.09	Dec.	3.77
San Pedro de Macoris 31	14	44.37	7.55	Sept.	1.57	Mar.	5.98
Santo Domingo 32	14	55.46	7.29	Oct.	1.20	Feb.	6.09
Puerto Plata 7 *	17	66.33	14.40	Nov.	1.66	June	12.74
Sanchez 31	10	78.38	8.90	Aug.	3.80	Feb.	5.10
Porto Rico							
Ponce 9	23	35.83	6.72	Oct.	0.97	Feb.	5.75
San Juan 9	25	60.64	6.86	Nov.	2.71	Feb.	4.15
Mayaguez 9	25	81.00	11.47	Aug.	1.87	Jan.	9.60
Toro Negro Dam 9	13	92.65	15.22	Oct.	3.97	Jan.	11.25
Virgin Is.							
Charlotte Amalie 33	17	40.89	6.15	Oct.	1.87	Feb.	4.28
Christiansted 34	37	46.43	5.89	Nov.	1.24	Mar.	4.65
St. Kitts							
Lower Canada 35	18	45.01	5.96	Sept.	1.57	Feb.	4.39
Basseterre 36	56	49.73	6.38	Sept.	1.95	Feb.	4.43
Brotherson 35	5	85.21	13.52	Nov.	2.58	Mar.	10.94
St. Johns 37 (*Antigua*)	50	49.38	5.74	Oct.	2.24	•Feb.	3.50

(See footnotes at end of table.)

TABLE 7.—*Mean annual precipitation, highest and lowest monthly means and range in monthly means (in inches)*—Continued

Stations	Length of record, years	Mean annual precipitation	Highest monthly mean	Month	Lowest monthly mean	Month	Range of mean monthly precipitation
Guadeloupe							
Celcour 14	19	56.72	6.42	Oct.	2.56	Feb.	3.86
Point a Pitre 14 *	19	91.80	10.39	Aug.	3.27	Feb.	7.12
Josephine 14	6	120.87	14.88	July	6.25	Apr.	8.63
Camp Jacob 26	10	156.22	20.20	July	6.73	Feb.	13.47
Dominica							
Batalie 38	5	69.92	9.43	July	1.09	Apr.	8.34
Roseau 39 *	27	77.64	10.75	July	2.97	Apr.	7.78
St. Aroment 38	20	105.03	14.40	July	3.80	Apr.	10.60
Shawford 38	5	193.28	23.08	July	9.09	Feb.	13.99
Martinique							
Robert 40	3	51.30	8.98	Dec.	1.46	Jan.	7.52
Fort de France 41 *	31	80.21	10.31	Aug.	2.91	Mar.	7.40
Morne des Cadets 25	9	120.19	15.24	Aug.	6.29	May	8.95
St. Lucia							
Moule a Chique 42	10	48.78	6.58	Oct.	1.55	Feb.	5.03
Choiseul 42	7	64.04	9.05	Oct.	2.01	Feb.	7.04
Castries 43	34	91.00	10.45	Aug.	3.89	Feb.	6.56
Uplyme 42	10	129.95	15.00	July	6.30	Apr.	8.70
St. Vincent							
Bayabou 44	6	69.56	10.08	Sept.	1.70	Apr.	8.38
Kingstown 45	11	90.80	12.60	Nov.	3.59	Mar.	9.01
Barbados							
Bridgetown 46	17	54.95	7.98	Sept.	1.54	Feb.	6.44
Binfield 46	18	66.43	9.47	Oct.	1.76	Mar.	7.71
Dunscombe 46	17	85.92	11.52	Sept.	2.96	Feb.	8.56
Grenada							
Point Saline 24	10	38.99	6.35	Aug.	0.39	Apr.	5.96
St. George 47	30	76.56	9.80	July	2.24	Apr.	7.56
Grand Etang 24	10	146.90	16.89	Nov.	6.49	Feb.	10.40
Tobago							
Government Farm 48	13	46.04	6.22	Oct.	0.90	Mar.	5.32
Botanic Station 48	23	71.62	9.20	July	1.95	Mar.	7.25
Roxborough Estate 48	12	91.10	11.19	Oct.	3.01	Apr.	8.18
Trinidad							
Port of Spain 49	26	56.41	8.42	Aug.	1.12	Feb.	7.30
Siparia 49	28	83.24	11.80	July	2.63	Feb.	9.17
Blanchisseuse 49	29	85.66	11.41	July	3.26	Apr.	8.15
Sangre Grande 49	27	111.92	13.99	July	4.08	Feb.	9.91
Willemstad 50 (*Curacao*).*	70	22.93	4.43	Nov.	0.76	May	3.67
Oranjestad 51 (*Aruba*)*.	24	17.41	3.43	Nov.	0.38	May	3.05
Swan Island 52	10	51.13	8.73	Nov.	0.98	Apr.	7.75

* From normal monthly and annual precipitation in the Caribbean region published in Climatological Data, West Indies and Caribbean Service, July, 1925.

• Also in another month.

In the following notes the period of record embraces the period from the first to the last year of the series of observations whether continuous or broken.

1-26. See footnotes to Table 3.

27. Contributed in Monthly Weather Review, January, 1925 by W. H. Potter. Period 1879–1924.

28. U. S. Weather Bureau records. Period 1880–1924.

29. Bulletin No. 1, Tropical Research Foundation, Rainfall and Temperature of Cuba, by O. L. Fassig.

30. The Rainfall of Jamaica, 1870–1919, by Maxwell Hall.

31. Revista de Agricultura, 1917, Santo Domingo, and Climatological Data, West Indies and Caribbean Service, U. S. Weather Bureau, San Juan, Porto Rico. Period 1909–1924.

32. U. S. Weather Bureau records and Annales du Bureau Central Météorologique de France 1910–1914. Period 1898–1924.

33. Annalen der Hydrographie und Maritimen Meteorologie, 1877, and U. S. Weather Bureau records 1917–1924. Periods 1863–1872 and 1917–1924.

34. Meteorologiske Aarbog, Danske Meteorologiske Institut. Period 1875–1916.

35. Monthly Weather Review, November, 1900.

36. Monthly Weather Review, Annual, 1899, and U. S. Weather Bureau records. Period 1856–1924.

37. Monthly Weather Review, April, 1901, and Meteorological Summary, Government Laboratory, St. Johns, Antigua. Period 1866–1923.

38. Quarterly Journal of the Royal Meteorological Society (London), October, 1897, and January, 1903.

39. Meteorologische Zeitschrift, October, 1886. Period 1865–1885. U. S. Weather Bureau records, 1917–1924 not included.

40. Climatological Data, West Indies and Caribbean Service, U. S. Weather Bureau, San Juan, Porto Rico. Period 1921–1923.

41. Annales du Bureau Central Météorologique de France, 1891–1914.

42. Rainfall Returns, St. Lucia. Period 1906–1921.

43. Rainfall Returns, Santa Lucia, 1908 (summary)–1923. Period 1890–1923.

44. Die Verteilung des Niederschlags auf der festen Erdoberfläche. Supan.

45. Meteorological Returns, St. Vincent. Period 1913–1923.

46. Meteorological Tables, Botanic Station, Barbados. (For periods see note under Table 57.)

47. Meteorological Report, Grenada, 1921. Period 1892–1921.

48. Meteorological Returns, Trinidad. Period 1900–1923.

49. Meteorological Returns, Trinidad. 1891–1919. (See footnotes to Table 64.)

50. Encyclopaedia van nederlandsch West Indie and Meteorologische Waarnemingen, Suriname en Curaçao. Periods 1894–1902 and 1905–1923.

51. Meteorologische Waarnemingen, Suriname en Curaçao. Period 1905–1923.

52. U. S. Weather Bureau records. Period 1915–1924.

Data on maximum rainfall in 24 consecutive hours are not available for many of the regions. The maxima (in inches) for some of the more important stations are as follows: Nassau, 8; Habana, 8.30; Kingston, 8.93; Port au Prince, 5.78; San Juan, 10.55; Basseterre, St. Kitts, 10.60; Castries, St. Lucia, 13.14; Kingstown, St. Vincent, 6.88; St. George (Richmond Hill), Grenada, 4.35. Interesting data on a remarkable series of torrential rains will be found in the discussion of precipitation in Jamaica.

The figures indicating frequency of precipitation do not admit of strict comparison since they are obtained in different ways. The minimum amount of precipitation characterizing a day as rainy is either 0.01 inch or 0.1 mm. (0.004 inch) for most of the stations. For the Greater Antilles the available data show the following range in number of rainy days in the year: Cuba, 92 to 115; Haiti, 43 to 135; Porto Rico, 92 to 213; and Jamaica, 76 to 178. For stations in the Lesser Antilles we find a rather considerable range: Christiansted, 136; Bridgetown, 171; Roseau, 209; St. Johns, 242; Castries, 260; and the elevated stations of Camp Jacob and Morne des Cadets, 288 and 290, respectively.

In the July, 1925, issue of Climatological Data, West Indian and Caribbean Service (San Juan, Porto Rico), appears a table containing monthly and annual means of precipitation for island areas. The regions with least annual precipitation, 27 to 32 inches, are the Bahamas, Turks and Caicos Islands, and Curaçao; Jamaica, Martinique, and Tobago receive annually about 75 inches, and for St. Lucia and Dominica there is a further increase to 80 and 93 inches, respectively. Table 8 gives data for the more important islands.

TABLE 8.—*Mean precipitation (in inches), for island areas*

Islands	Number of stations	Length of record, years	January	February	March	April	May	June	July	August	September	October.	November	December	Annual
Bahama	15	4–5	1.62	0.90	1.31	2.35	4.87	3.02	2.77	2.50	3.73	6.83	2.27	0.74	32.28
Turks-Caicos	7	4–5	1.99	1.39	1.05	1.33	1.63	1.22	1.76	1.32	3.12	4.14	4.86	1.38	24.62
Cuba	20	20	1.92	1.53	2.11	2.85	6.79	8.37	5.22	5.78	7.81	6.79	3.67	2.15	54.99
Jamaica	210	20–60	3.84	3.06	3.23	5.06	9.14	7.30	5.26	6.84	7.54	10.57	8.22	5.56	75.62
Haiti, west [a]	25	8–44	1.77	2.17	2.55	4.46	6.81	4.47	3.36	4.66	5.92	6.07	4.57	2.21	49.00
Haiti, east [b]	40	4–5	2.93	1.92	2.41	3.17	3.70	3.58	4.71	4.31	5.85	5.05	4.90	3.32	45.29
Porto Rico	40	10–26	3.68	2.98	3.43	4.74	6.57	6.43	6.49	7.26	7.95	8.18	7.38	4.85	69.94
St. Thomas	3–6	48	2.76	2.12	1.87	2.56	4.32	3.73	3.86	4.50	4.86	5.98	6.42	3.85	46.83
St. Croix	3	73	2.33	1.92	1.68	2.68	4.32	3.90	3.59	4.47	5.70	6.61	5.25	3.47	45.92
St. Kitts	4	25	3.64	2.56	2.36	3.14	4.62	4.36	4.80	6.42	6.66	6.35	5.82	4.39	55.12
Antigua	70	25	2.57	1.70	1.66	2.62	3.07	2.91	3.48	3.86	5.06	5.27	5.84	3.54	41.58
Montserrat	6	30	4.21	2.71	3.09	3.03	4.63	4.60	5.36	5.56	6.63	6.46	7.35	5.15	58.78
Guadeloupe	45	8	4.09	3.53	2.52	4.19	4.66	4.30	5.58	5.44	7.33	10.23	8.97	4.61	65.45
Dominica	10	8	6.59	4.33	4.61	4.15	5.44	7.77	12.22	12.02	10.15	10.90	7.60	7.47	93.25
Martinique	20	4–5	4.46	3.18	2.71	2.89	3.15	8.32	9.26	9.66	10.36	8.00	7.42	9.63	77.20
St. Lucia	10–30	10	5.40	3.85	3.56	2.68	4.32	7.40	9.14	10.11	8.94	10.31	7.77	6.76	80.24
Barbados	3–233	78	3.46	2.26	2.06	2.42	3.38	5.57	6.14	7.45	7.74	7.75	7.28	4.98	60.49
Tobago	5	16	4.28	2.68	2.15	2.35	4.41	8.71	9.40	8.07	8.26	8.80	8.89	6.64	74.64
Trinidad	12–90	53	3.71	1.90	2.23	2.32	4.52	9.21	9.42	9.52	7.01	6.45	7.61	6.16	70.06
Curaçao	10	4–5	2.25	1.13	1.82	0.40	0.25	0.73	1.72	1.32	1.53	6.94	4.25	5.64	27.10

[a] Republic of Haiti. [b] Dominican Republic.

Thunderstorms.—Data on the number of days with thunderstorm do not cover any considerable period except at a few stations, but these are rather well distributed over the West Indian area. The mean annual number of days with thunderstorm varies rather widely: Port au Prince, 114; Cienfuegos, 101; Habana, 78; Kingston, 54; San Juan, 49; Christiansted, 16; St. Johns, 15; St. George, Grenada, 12. In these figures we note a striking difference between conditions over the Greater Antilles and those over the smaller Leeward and Windward Islands. From November to April thunderstorms are rare, and in the smaller islands they are practically unknown from January to April. In May and June there is a considerable increase in frequency and later a further slight increase to the maximum during the three-month period beginning with July; at that time the average monthly number of days with thunderstorm is from 15 to 20 for Port au Prince, Cienfuegos, and Habana, but less than 5 for stations on the smaller islands.

Fog.—From data published in the West Indies Pilot it appears that fog of any considerable density is practically unknown at low elevations in the southern part of this region; farther north in the Lesser Antilles, the mean annual number of days with fog is about 2, and at Habana and Cienfuegos there is an increase to 8 and 11, respectively. During the period of maximum frequency, January to March, the mean monthly number of foggy days at these two stations is about 2.

Wind.—The prevailing winds are from east or northeast, with many stations showing the former direction in all months. At Nassau and Habana we find in the prevailing directions in the warmer months a slight veering (from northeast to southeast and from northnortheast to east, respectively), which is probably connected with the development of the sea breeze. The fact that no change is noted at many stations may be due in part to the small land area or to the choice of hours of observation. The phenomenon of alternation of land and sea breezes reaches a marked development in some regions as, for example, at Cienfuegos, Kingston, and Port au Prince.

Mean annual wind velocities are not strictly comparable on account of differences in the elevation of the anemometer, but it appears that the highest mean value is that of 13 miles per hour at San Juan (open exposure, elevation 54 feet) and that the means range down to 5 miles per hour at Santo Domingo and Roseau. In the Bahamas and Cuba wind velocities have a slightly marked maximum from November to April; at several stations in the remainder of the area the maximum occurs in the period from May to August.

Maximum wind velocities have been recorded for only a few stations; the following (in miles per hour) are the extremes reported: Habana, 134, October 11, 1909 (other high values in station table); San Juan, 92, August 22, 1916; Basseterre, St. Kitts, 72, August 7, 1899; and Bridgetown, 62, September 10, 1898.

Days with winds of gale force are rare in the West Indies, especially in the southern part of the region. At Nassau, Cienfuegos, and San Juan the mean annual number of days with gale winds is about 3; at Habana

there is a rather large increase, the mean annual number being 18 for the period from 1911 to 1921. Gales are more frequent in the cooler season; at Habana the mean monthly frequency is about 2 from November to April.

Hurricanes.—A recent paper by C. L. Mitchell, issued as Supplement No. 24, MONTHLY WEATHER REVIEW, contains charts showing tracks of hurricanes for the years 1887–1923, and tables giving monthly and annual frequency of tropical storms. The following table is reproduced.

TABLE 9.—*Monthly frequency of West Indian hurricanes and other tropical storms of the North Atlantic Ocean (1887–1923)*

[From Weather Bureau Supplement No. 24]

	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Season
Number of storms	1	16	17	39	78	71	15	2	239
Percentage	0	7	7	16	33	30	6	1	

	Storms of known hurricane intensity	Doubtful	Not of hurricane intensity	Total
May	0	0	1	1
June	6	5	5	16
July	10	3	4	17
August	32	3	4	39
September	46	15	17	78
October	26	23	22	71
November	2	6	7	15
December	0	2	0	2
Total	122	57	60	239
Percentage	51	24	25	

CLIMATIC CONDITIONS IN THE SEVERAL ISLANDS OR GROUPS OF ISLANDS

The remainder of this paper will be devoted to a presentation of short descriptive text and tabulated data for the different islands composing this extensive group. Throughout text and tables, temperatures are given in degrees Fahrenheit; relative humidity, in percentage of saturation; cloudiness, according to the scale 0–10; precipitation, in inches; wind velocity, in miles per hour.

BERMUDA ISLANDS

The mean annual temperature is 75°; the mean for August is 85° and that for February is 67°, the difference of 18° showing a considerable change from summer to winter. The recorded absolute extremes are 94° and 39°. The relative humidity averages 82 per cent at 9 a. m., 78 per cent at 3 p. m., and 85 per cent at 9 p. m. for mean annual values; the maxima from May to September are only slightly higher. Precipitation is very uniformly distributed through the year; the maximum in October (6 inches) and the minimum in April (4 inches) show very little departure from the mean monthly value of 5 inches (annual mean, 57.80 inches). Southerly winds prevail and are especially frequent from June to August; northerly winds are frequent except in the period just mentioned and prevail from October to December. The wind velocity presents a very regular annual march with a maximum of 16 miles per hour in February and a minimum of 10 miles per hour in August.

The *Meteorologische Zeitschrift* for August, 1897, gives a summary of the data for the period 1852–1886, published in full in Meteorological Observations at the Foreign and Colonial Stations of the Royal Engineers and the Army Medical Department, London Meteorological Office, No. 83. The MONTHLY WEATHER REVIEW for January, 1925, contains a tabulation of monthly precipitation for the period 1870–1924, prepared by W. H. Potter.

The records for Prospect (32° 18′ N., 64° 46′ W., elevation 151 feet), near Hamilton, for recent years form the basis of Table 10.

TABLE 10.—*Prospect, Bermuda*

	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	24	67.7	66.9	68.2	69.9	74.3	79.5	83.9	85.1	83.0	78.7	72.9	69.3	75.0
Mean minimum	24	57.6	56.7	57.7	59.2	63.8	69.1	72.8	73.8	72.1	68.9	63.1	59.7	64.5
Mean	24	62.6	61.8	63.0	64.6	69.0	74.3	78.4	79.4	77.6	73.8	68.0	64.5	69.8
Highest	32	79	75	78	80	83	88	92	94	91	88	82	79	94
Lowest	32	39	45	44	40	49	54	65	64	61	57	49	46	39
Relative humidity														
Mean, 3 observations *	10	82	82	80	81	83	84	82	82	83	81	80	80	82
Cloudiness														
Mean, 3 observations *	12	6.7	6.6	5.9	5.7	5.6	5.6	5.3	5.2	5.2	5.5	6.2	6.4	5.8
Precipitation														
Mean	55	4.48	4.60	4.74	4.10	4.54	4.49	4.53	5.40	5.19	5.95	5.01	4.78	57.80
Maximum in 24 hours	47	3.84	3.30	5.86	10.75	5.50	8.00	3.35	3.08	6.58	5.04	6.00	4.64	10.75
Days with rain	23	16	16	14	11	9	11	12	14	13	14	15	17	162
Days with thunderstorm	22	1	1	1	1	1	2	3	4	3	2	1	1	21
Wind														
Prevailing direction, 3 observations *	12	sw.	sw. nw.	sw.	sw.	sw.	sw.	sw.	sw.	sw.	ne.	ne. nw.	nw.	sw.
Mean hourly velocity	14	14.1	15.6	15.0	13.9	11.2	10.9	10.3	9.5	10.1	11.7	13.4	13.9	12.5
Maximum velocity †	9	42	51	48	42	31	34	28	30	56	38	54	46	56
Direction at maximum velocity		s. w.	s.	n. w.	n. e.	s. w.	s. w.	s. w.	s. w.	n. e.	n. w.	n. e.	s.	n. e.
Days with gales	53	0.5	0.6	0.5	0.2	0.0	0.1	0.1	0.1	0.5	0.4	0.4	0.3	3.7
Days with fog	56	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2

* 9 a. m., 3 p. m., 9 p. m.

† For the period 1907–1915. Complete record for later years not available. "Hurricane wind 100 miles southeast to southwest" on Sept. 15, 1921 and "Wind 100 miles northwest and west" on Sept. 21, 1922.

BAHAMA ISLANDS

Nassau (25° 5′ N., 77° 21′ W., elevation 12 feet) lies near the middle of this region, and the statement of conditions there may be taken as typical of the entire group of islands, except, perhaps, in regard to precipitation.

The mean annual temperature at Nassau is 77°; the highest monthly mean is 82° in August and the lowest 71° in January. The extreme range in temperature is approximately from 95° to 50°. Relative humidity and cloudiness show but little change from month to month, but the precipitation is rather unevenly distributed. For the period May–October the mean monthly rainfall is over 6 inches, while for the remainder of the year it is only 2 inches. Southeast winds prevail from May to August, or approximately during the period of heavier precipitation; northeast winds, somewhat stronger, prevail in the other months.

A very interesting paper on meteorological conditions at Nassau appears in the Quarterly Journal of the Royal Meteorological Society (London) for January, 1921. In addition to the climatic summary given there the author, C. E. P. Brooks, includes the monthly rainfall record for the period 1852–1919, compiled in part from the British publication previously mentioned in relation to early data for the Bermuda Islands.

TABLE 11.—*Nassau, New Providence*

	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	15	78.0	76.6	78.3	79.9	83.3	85.8	87.5	88.3	87.2	85.0	80.0	77.6	82.1
Mean minimum	15	66.6	66.5	68.0	69.4	72.4	74.7	75.9	76.5	75.8	74.6	71.2	68.6	71.7
Mean	15	71.3	71.6	73.2	74.6	77.8	80.2	81.7	82.4	81.5	79.8	75.6	73.1	76.9
Highest	15	85	85	86	90	90	92	93	94	92	92	89	85	94
Lowest	15	51	54	55	58	65	63	67	67	65	65	56	53	51
Relative humidity														
Mean, 8 a., 3 p.	24	76	74	71	71	73	73	72	72	73	74	74	75	73
Cloudiness														
Mean, 8 a., 3 p.	44	5.4	5.3	5.1	5.2	6.0	6.2	5.9	5.9	5.9	5.9	5.4	5.3	5.6
Precipitation														
Mean	56	2.17	1.61	1.59	2.63	5.66	6.79	5.77	6.66	7.54	6.24	2.84	1.49	50.99
Maximum in 24 hours	52	4.50	2.74	2.46	2.88	7.44	5.37	4.38	6.37	6.54	*8.00	7.41	2.37	*8.00
Days with rains	52	9	7	6	6	11	13	16	16	17	14	9	8	132
Wind														
Prevailing direction, 2 observations	44	ne.	ne.	ne.	ne.	se.	se.	se.	se.	ne.	ne.	ne.	ne.	ne
Mean hourly velocity	34	9.0	9.0	9.0	9.0	7.0	6.0	6.0	6.0	6.0	8.0	9.0	9.0	8.0
Days with gales	52	0.5	0.5	0.3	0.3	0.2	0.0	0.0	0.2	0.3	0.3	0.5	0.5	3.6
Days with fog	52	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5

* Estimated; gage blown away in hurricane; next highest amount for October was 6.15 inches.

TURKS ISLAND

The somewhat broken record of rainfall for the station at Grand Turk (21° 21′ N., 71° 7′ W., elevation 12 feet) covers the period from 1880 to 1924; data for other meteorological elements are available for the periods 1900–1908 and 1916–1924, the latter being chosen as the basis of the table.

This station lies about 5 degrees south of Nassau and has a mean annual temperature 2° higher (79°). The observed absolute extremes of temperature are 92° and 60°. The yearly rainfall is much lighter than at Nassau —29 inches as compared to 51 inches. The monthly amounts of precipitation show a rather uniform march, with maximum of about 4 inches in October and November and minimum of 1 inch in March.

TABLE 12.—*Grand Turk, Turks Island*

	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	9	80.2	80.3	81.1	82.8	84.6	87.0	87.4	88.2	87.1	86.5	83.3	81.7	84.2
Mean minimum	9	69.9	70.1	70.9	72.4	75.3	76.6	77.4	77.9	77.2	76.2	73.3	71.6	74.1
Mean	9	75.0	75.2	76.0	77.6	80.0	81.8	82.4	83.0	82.2	81.4	78.3	76.6	79.1
Highest	9	88	88	90	90	90	91	92	92	92	92	90	89	92
Lowest	9	60	62	60	62	65	69	66	70	70	70	64	62	60
Cloudiness														
Mean	4	5.3	4.4	4.7	4.6	6.2	5.4	5.2	5.2	5.0	5.7	5.6	5.3	5.2
Precipitation														
Mean	40	2.21	1.42	1.11	1.51	2.59	1.58	1.74	2.03	3.22	3.98	4.51	2.75	28.65
Maximum in 24 hours	19	2.20	2.60	2.78	2.03	4.34	3.97	3.67	3.30	2.82	5.34	3.81	2.08	5.34
Days with rain	19	13	8	8	6	8	9	10	12	11	13	14	13	125

CUBA [1]

Temperature.—The lowest mean annual temperature is 73.5° at Camajuani, a few miles inland from the middle of the northern coast; there is a slight increase to 75° at Habana and a further increase to 78° at Pinar del Rio, in the extreme western interior. In the eastern half of the island the mean annual temperature ranges between 76° at Cienfuegos and 79° at Santiago de Cuba. In the warmest season, July and August, the extremes in monthly means are 83° at Pinar del Rio and 78° at Camajuani, in the coolest season, January and February, they are 75° at Santiago de Cuba and 68° at Camajuani. At interior stations maximum temperatures exceed 100° (extreme 104° at Pinar del Rio), while 95° is the highest reading for the coast stations of Habana and Cienfuegos. From June to October minimum temperatures are generally between 62° and 68°; in December–February they occasionally fall to 50° or lower, and on very rare occasions to 40 or below (extreme 38° at Moron [2]).

Precipitation.—The mean annual rainfall is generally from 60 to 70 inches in the extreme western province of Pinar del Rio, in the southern part of the Province of Habana, and at Nueva Gerona, on the Isle of Pines. In the Provinces of Matanzas, Santa Clara, and Camaguey it is approximately 50 to 55 inches, while in the Province of Oriente there is a further decrease to 40 to 45 inches. There are some instances of considerable difference in

[1] Reference: *Boletin oficial de la secretaria de agricultura, comercio y trabajo.* Habana.
[2] Station not included in the tables on account of the apparently very inconsistent record. The data for Camajuani are taken as representative of the middle section of the northern coast region.

the amounts of rain received at stations separated by short distances: Bahia Honda and Herradura, in Pinar del Rio (69 and 53 inches), Batabano, and Habana in Habana (65 and 43 inches), Union de Reyes and Matanzas in Matanzas (71 and 51 inches), "Soledad" and "Montserrat" (near Cienfuegos), in Santa Clara (52 and 39 inches), and Firmeza and Guantanamo, in Oriente (58 and 41 inches).

The march of precipitation is as follows: Minimum in January or February, except at a few stations, where slightly lower values are found for December or March, maxima in May or June and in September–November (according to locality) separated by a fairly well marked secondary minimum. In the middle and western provinces there is a very great increase in rainfall from April to June, with monthly means of 9 to 12 inches at nearly all stations. July and August show a considerable decrease from this maximum, but in September and October the averages are comparable with those of June and in some localities they are even greater. In the Province of Oriente the first maximum (secondary) occurs in May and the second (chief) in October or November, when the highest means are generally from 7 to 8 inches. In this region the secondary minimum in July is very pronounced.

In Bulletin No. 1 issued by the Tropical Plant Research Foundation (Washington, D. C.) O. L. Fassig contributes a paper on rainfall and temperature of Cuba, which presents in much detail the data collected by the National Observatory of Cuba.

Most of the stations in the following tables have low elevations; the highest are Camaguey and Camajuani, at 345 and 325 feet, respectively.

It is necessary to note that the means of temperature and precipitation for some stations are based on records that are much broken. It may be assumed, however, that the length of record for these stations is such as to give values that are comparable with those for stations where the series is uninterrupted or consists of rather long divisions.

TABLE 13.—*Temperature data for Cuba.* (°F.)

MEAN MAXIMUM TEMPERATURE

Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Pinar del Rio	20	79.2	80.4	83.5	86.4	89.2	89.2	90.5	90.5	88.9	86.2	82.2	79.7	85.2
Habana [a]	21	76.1	76.8	78.3	80.1	82.4	83.3	84.0	84.2	83.5	81.9	78.8	77.0	80.5
Nueva Gerona	9	80.6	80.2	83.8	86.7	88.0	87.8	89.1	88.6	88.0	85.8	82.4	80.8	85.2
Cienfuegos, Soledad	17	79.0	80.6	83.7	86.0	87.6	88.0	89.2	88.5	87.6	85.3	81.5	79.5	84.7
Cienfuegos, Montserrat [b]	11	79.2	79.5	81.5	83.1	84.6	84.7	87.3	87.8	86.4	85.3	81.3	80.1	83.4
Camajuani	16	77.0	78.4	81.9	83.1	86.2	88.0	88.5	88.9	86.9	84.4	79.7	77.9	83.4
Camaguey	13	80.6	83.1	86.2	88.5	88.9	89.4	91.2	91.2	89.6	87.3	84.2	82.2	86.9
Preston	10	80.4	81.1	82.0	82.8	85.6	87.6	88.7	88.9	89.2	88.0	84.0	82.0	85.0
Santiago de Cuba	16	82.6	82.6	83.8	85.1	86.0	87.3	89.1	89.6	88.2	87.1	84.7	83.3	85.8

MEAN MINIMUM TEMPERATURE

Pinar del Rio	20	63.7	63.9	65.8	68.2	72.1	73.9	75.0	74.8	74.1	72.7	67.8	65.3	69.8
Habana [a]	21	63.5	63.0	65.8	68.5	72.0	73.9	74.5	74.8	74.5	72.5	67.6	63.9	69.5
Nueva Gerona	9	66.2	63.5	66.9	69.4	72.3	74.3	74.7	74.8	73.4	72.5	70.0	67.1	70.4
Cienfuegos, Soledad	17	60.1	60.4	62.8	65.1	68.7	71.1	71.4	71.4	70.2	69.4	64.0	62.4	66.4
Cienfuegos, Montserrat [b]	11	64.4	63.0	64.8	67.8	70.7	73.0	73.2	73.4	72.7	71.6	67.6	65.1	68.9
Camajuani	16	58.3	57.9	59.4	61.9	65.5	66.4	67.6	68.0	67.5	66.7	63.3	60.4	63.6
Camaguey	13	62.6	63.5	65.5	67.5	70.0	71.2	72.0	72.1	71.2	69.8	67.1	64.0	68.0
Preston	10	66.9	66.4	67.6	69.4	71.2	72.3	73.0	73.4	72.7	72.3	70.9	68.0	70.3
Santiago de Cuba	16	68.2	67.6	69.4	71.2	73.4	74.1	74.7	74.7	73.9	72.9	70.7	69.1	71.7

[a] For the period beginning June, 1899. There were some slight changes in elevation in the earlier years; since April, 1908, this has been practically the same as at present—*Casa Blanca*, 49 feet.

[b] Values for Montserrat, Cienfuegos, are means for 6 a. m. and 2 p. m.

TABLE 13.—*Temperature data for Cuba.* (°F.)—Continued

MEAN TEMPERATURE

Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Pinar del Rio	20	71.4	72.2	74.6	77.3	80.6	81.6	82.8	82.6	81.5	79.4	75.0	72.5	77.6
Habana [a]	21	69.8	69.9	72.0	74.3	77.2	78.6	79.2	79.5	79.0	77.2	73.2	70.4	75.0
Nueva Gerona	9	73.4	71.8	75.4	78.0	80.2	81.0	81.9	81.7	80.7	79.2	76.2	74.0	77.8
Cienfuegos, Soledad	17	69.6	70.5	73.2	75.6	78.2	79.6	80.3	80.0	78.9	77.4	72.8	71.0	75.6
Cienfuegos, Montserrat [b]	11	71.8	71.2	73.2	75.4	77.6	78.8	80.2	80.6	79.6	78.4	74.4	72.6	76.2
Camajuani	16	67.6	68.2	70.6	72.5	75.8	77.2	78.0	78.4	77.2	75.6	71.5	69.2	73.5
Camaguey	13	71.6	73.3	75.8	78.0	79.0	80.3	81.6	81.6	80.4	78.6	75.6	73.1	77.4
Preston	10	73.6	73.8	74.8	76.1	78.4	80.0	80.8	81.2	81.0	80.2	77.4	75.0	77.7
Santiago de Cuba	16	75.4	75.1	76.6	78.2	79.7	80.7	81.9	82.2	81.0	80.0	77.7	76.2	78.7

HIGHEST TEMPERATURE

Pinar del Rio	20	89	92	94	99	104	101	104	100	98	96	91	89	104
Habana	21	89	88	90	92	93	94	93	93	95	93	91	89	95
Nueva Gerona	9	90	93	93	97	102	99	99	97	95	97	91	91	102
Cienfuegos, Soledad	17	89	89	89	92	95	97	97	97	96	92	90	89	97
Cienfuegos, Montserrat	11	88	91	92	91	94	94	95	94	95	93	91	89	95
Camajuani	16	89	88	90	95	98	98	97	99	95	91	90	88	99
Camaguey	13	91	94	98	97	102	101	100	100	98	97	93	93	102
Preston	10	90	93	93	93	98	98	98	98	102	98	96	95	102
Santiago de Cuba	16	90	90	92	93	94	95	97	96	97	95	93	93	97

LOWEST TEMPERATURE

Pinar del Rio	20	46	48	49	51	57	66	66	68	64	62	52	47	46
Habana	21	50	51	55	56	59	65	65	67	68	61	56	53	50
Nueva Gerona	9	52	50	52	57	63	68	66	68	68	63	55	52	50
Cienfuegos, Soledad	17	46	46	48	51	57	64	65	65	65	59	53	40	40
Cienfuegos, Montserrat	11	46	45	46	50	56	66	68	67	68	60	52	48	45
Camajuani	16	44	41	46	49	53	59	61	62	61	57	50	40	40
Camaguey	13	46	49	52	51	56	62	67	66	64	62	52	45	45
Preston	10	50	53	58	62	62	64	62	68	66	66	62	56	50
Santiago de Cuba	16	57	59	58	57	65	62	67	68	67	67	61	55	55

[a] For the period beginning June, 1899. There were some slight changes in elevation in the earlier years; since April, 1908, this has been practically the same as at present—*Casa Blanca*, 49 feet.

[b] Values for Montserrat, Cienfuegos, are means for 6 a. m. and 2 p. m.

TABLE 14.—*Precipitation data for Cuba*

MEAN PRECIPITATION (INCHES), BY PROVINCES

Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Pinar del Rio														
Pinar del Rio*	25	1.82	1.74	2.48	2.62	6.97	10.29	6.61	7.01	10.65	7.74	2.46	1.39	61.78
Herradura	15	1.52	1.19	2.33	2.92	5.68	9.42	4.79	5.48	7.58	8.66	2.11	1.28	52.96
Bahia Honda	9	4.36	2.26	3.36	2.61	5.43	8.59	6.76	7.44	9.03	9.40	5.73	3.68	68.65
Habana														
Habana*	25	2.98	1.33	1.78	1.58	4.71	5.26	4.33	4.27	5.18	6.21	3.20	2.17	43.00
Batabano*	25	2.42	2.07	2.53	2.69	7.92	8.13	6.41	8.95	11.77	8.46	2.62	1.28	65.25
Aguacate*	25	2.18	1.85	2.46	2.63	7.75	9.88	7.88	6.37	8.84	6.05	2.84	2.12	60.85
Isle of Pines														
Nueva Gerona*	13	1.47	2.16	2.40	3.93	8.63	11.96	7.58	7.67	11.06	9.93	2.30	1.59	70.68
Matanzas														
Matanzas*	17	2.52	1.36	2.32	2.37	5.94	9.32	4.50	5.40	5.75	6.10	2.61	3.32	51.51
Union de Reyes*	21	0.97	1.86	3.07	2.96	10.17	12.21	8.35	8.82	10.48	8.16	2.16	1.42	70.63
Banaguises*	21	1.17	1.79	2.48	2.84	6.45	9.36	7.02	7.30	9.02	5.32	2.28	1.58	56.61
Santa Clara														
Sierra Morena	14	2.48	1.04	2.07	1.68	4.33	9.25	4.39	6.27	5.17	6.29	3.90	2.39	49.26
Cienfuegos, Soledad*	25	1.26	1.44	1.87	2.29	6.44	7.63	6.18	6.48	8.04	7.32	2.14	1.25	52.34
Cienfuegos, Montserrat	11	0.69	0.84	1.33	1.49	4.21	5.82	5.05	4.97	5.77	5.46	2.25	0.87	38.75
Cruces*	21	1.38	1.65	2.06	3.03	6.69	8.89	5.98	7.58	9.04	6.11	2.32	2.06	56.79
San Antonio	25	1.47	0.93	1.98	2.88	7.46	8.96	5.29	5.84	6.87	7.24	4.12	2.65	55.69
Camajuani*	21	2.05	1.12	1.47	2.93	6.41	9.33	5.24	5.44	6.39	7.13	4.90	2.83	55.24
Yaguajay*	18	2.05	1.43	2.18	3.09	6.01	8.89	4.60	6.11	7.95	6.88	5.25	2.20	56.64

* Data furnished by San Juan (Porto Rico) office of the U. S. Weather Bureau.

TABLE 14.—*Precipitation data for Cuba*—Continued

MEAN PRECIPITATION (INCHES), BY PROVINCES—Continued

Stations	Length of record, years	January	February	Mrch	April	May	June	July	August	September	October	November	December	Annual
Camaguey														
Ciego de Avila*	16	1.08	1.19	1.26	1.96	5.44	9.41	5.28	5.21	7.87	6.20	2.58	0.56	47.99
Ceballos	15	1.48	0.73	1.01	2.30	7.99	8.71	4.90	5.52	7.67	7.47	2.76	0.87	51.41
Camaguey*	20	1.54	1.40	2.43	3.64	7.62	10.52	5.60	5.54	7.26	5.44	3.12	1.96	56.07
La Gloria*	17	2.72	1.30	1.64	3.63	7.97	5.84	3.73	3.51	6.40	7.37	5.79	2.38	52.28
Nuevitas	11	2.21	1.17	1.93	4.41	5.04	3.93	3.06	2.65	4.90	5.06	6.51	3.06	43.93
Oriente														
Manzanillo*	14	0.60	0.84	2.15	2.98	7.48	9.06	5.67	5.79	8.08	6.83	2.55	1.25	53.28
Gibara*	20	2.96	1.42	1.40	2.07	6.08	3.73	1.74	2.75	4.47	7.21	7.95	3.18	44.96
Banes	13	3.54	1.76	2.17	4.06	4.66	2.91	1.62	2.49	4.03	5.72	7.65	4.73	45.34
Preston*	17	4.09	2.21	1.25	2.88	4.65	2.36	1.50	2.06	3.88	6.42	8.21	5.31	44.81
Santiago de Cuba*	21	1.47	0.87	1.72	3.32	6.45	5.39	2.26	3.58	6.66	7.40	3.61	1.06	43.79
Firmeza	22	1.36	1.28	2.52	4.30	8.02	4.93	3.90	6.17	9.04	11.04	3.66	1.44	57.66
Guantanamo	23	0.72	1.03	2.06	3.43	6.45	4.52	3.01	3.36	6.06	6.98	2.27	1.10	40.99

MAXIMUM PRECIPITATION IN 24 HOURS (IN INCHES)

Pinar del Rio	19	3.54	2.83	5.16	2.76	5.00	5.20	2.17	3.62	12.68	8.46	17.99	3.98	17.99
Habana	21	6.68	3.07	1.89	3.70	5.47	3.76	2.80	3.15	3.39	10.33	7.04	2.53	10.33
Nueva Gerona	10	1.85	3.46	3.46	4.55	3.65	4.51	2.53	3.60	6.85	6.40	3.85	2.78	6.85
Cienfuegos Soledad	20	2.18	1.61	1.50	2.50	3.60	8.80	3.25	4.10	7.20	6.50	8.00	2.00	8.80
Camajuani	17	1.33	1.30	1.83	2.88	3.82	5.10	2.65	3.34	3.39	4.19	8.67	2.65	8.67
Camaguey	17	1.97	2.64	11.81	4.60	6.14	4.88	4.21	4.37	4.13	4.29	7.68	3.37	11.81
Preston	12	5.24	2.84	1.50	5.20	2.82	4.02	2.40	2.15	2.60	7.44	4.70	7.80	7.80
Santiago de Cuba	16	3.45	1.02	1.57	3.94	4.53	7.28	6.23	4.38	14.34	8.62	5.10	2.14	14.34

* Data furnished by San Juan (Porto Rico) office of the U. S. Weather Bureau.

TABLE 14.—*Precipitation data for Cuba*—Continued

MEAN NUMBER OF DAYS WITH PRECIPITATION

Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Pinar del Rio	23	4	4	5	4	11	14	13	13	14	11	4	3	110
Habana	24	7	5	5	4	8	11	9	11	12	13	9	7	101
Nueva Gerona	12	3	4	5	6	12	17	14	14	16	14	3	3	111
Cienfuegos, Soledad	21	3	2	4	4	10	13	13	13	14	11	4	3	94
Camajuani	20	7	4	5	6	11	14	11	10	14	15	10	8	115
Camaguey	18	5	8	6	6	12	15	11	11	13	13	9	5	114
Preston	14	11	7	5	7	8	5	5	5	9	10	11	10	93
Santiago de Cuba	17	4	3	4	6	10	10	8	10	11	14	7	5	92

In the general tables Habana is represented by the series of observations beginning in June, 1899. In addition to this series there is available the much longer one at the Belen Observatory, which has been summarized to include the year 1914 in Proceedings of the Second Pan American Scientific Congress, Vol. II, p. 132. That paper, by P. Mariano Gutierrez-Lanza, is the basis of the table for Habana. The observations at Montserrat furnish a valuable series for Cienfuegos for the period of 11 years—1911–1921.

These stations are situated as follows: Belen Observatory, Habana, 23° 8′ N., 82° 21′ W., elevation 80 feet; Montserrat Observatory, Cienfuegos, 22° 9′ N., 80° 27′ W., elevation 98 feet.

TABLE 15.—*Habana (Belen), Cuba*

	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean, 2 p.	18	75.2	76.5	78.8	80.1	82.2	83.7	84.9	85.5	84.2	82.0	78.8	76.6	80.7
Mean, 6 a.	18	65.8	65.8	67.5	69.8	72.7	75.0	75.6	75.6	75.0	73.9	70.2	67.6	71.2
Mean, 6 a., 2 p.	18	70.5	71.2	73.2	75.0	77.4	79.4	80.2	80.6	79.6	78.0	74.5	72.1	76.0
Mean bihourly readings	18	70.3	70.9	73.2	75.2	77.7	79.5	80.4	80.6	79.9	78.1	74.3	71.8	76.6
Highest	25	89	91	91	94	93	96	93	95	94	94	90	90	96
Lowest	25	50	50	53	55	59	66	66	68	67	62	55	53	50
Relative humidity														
Mean, 6 a., 2 p., 8 p.	43	75	74	72	72	75	78	77	78	80	78	76	75	76
Mean bihourly readings [a]	43	74	72	70	69	72	75	73	75	78	77	75	74	74
Precipitation														
Mean	63	2.84	1.84	1.92	2.28	4.45	6.46	4.87	5.48	5.78	6.57	3.15	2.44	48.08
Maximum in 24 hours	53	6.43	3.13	3.30	8.30	6.27	4.78	4.07	4.44	3.76	6.53	7.56	3.47	8.30
Days with rain	46	8	6	5	5	10	14	12	14	15	15	10	9	123
Days with thunderstorm	20	1	1	2	3	7	13	15	16	12	6	1	1	78
Wind														
Prevailing direction	11	n.	ene.	ene.	ene.	ene.	e.	e.	e.	e.	nne.	ene.	ene.	ene.
Mean hourly velocity	41	7.3	7.4	7.8	7.8	6.8	5.9	5.6	5.4	5.4	7.2	7.6	7.4	6.8
Maximum velocity [b]	45	56	72	67	58	63	58	58	67	101	134	78	58	134
Days with gales [c]	11	2.4	1.7	1.7	2.8	0.9	0.5	0.8	0.7	1.1	0.5	2.0	0.7	15.8
Days with fog	30	1.0	2.0	2.0	1.0	1.0	0.5	0.3	0.4	0.4	0.6	0.5	1.0	10.7

[a] Bihourly readings, except for 12 p. m., and 2 a. m.
[b] The dates of occurrence of gales of hurricane force (with velocities in miles per hour) are as follows: Sept. 5, 1888, 94; Sept. 24, 1894, 101; Oct. 11, 1909, 134; Oct. 17, 1910, 101.
[c] These data are for the period 1911–1921; values for the preceding decade are considerably higher (annual mean about 30).

TABLE 16.—*Cienfuegos (Montserrat), Cuba*

	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean, 2 p.	11	79.2	79.5	81.5	83.1	84.6	84.7	87.3	87.8	86.4	85.3	81.3	80.1	83.4
Mean, 6 a.	11	64.4	63.0	64.8	67.8	70.7	73.0	73.2	73.4	72.7	71.6	67.6	65.1	68.9
Mean, 6 a., 2 p.	11	71.8	71.2	73.2	75.4	77.6	78.8	80.2	80.6	79.6	78.4	74.4	72.6	76.2
Highest	11	88	91	92	91	94	94	95	94	95	93	91	89	95
Lowest	11	46	45	46	50	56	66	68	67	68	60	52	48	45
Relative humidity														
Mean, 6 a., 2 p., 8 p.	11	75	74	73	72	75	79	77	78	81	81	79	78	77
Precipitation														
Mean	11	0.69	0.84	1.33	1.49	4.21	5.82	5.05	4.97	5.77	5.46	2.25	0.87	38.75
Maximum in 24 hours	11	0.95	1.04	1.85	1.34	3.34	4.45	2.40	2.08	2.40	4.53	4.30	1.68	4.53
Days with rain	11	4	3	5	5	10	14	14	16	15	13	5	3	107
Days with thunderstorm	11	(a)	1	3	4	9	16	20	20	16	9	2	1	101
Wind														
Prevailing direction	11	ne.	ne.	ssw.	ssw.	ssw.	ssw.	ne.	ne.	ssw.	ne.	ne.	ne.	ne.
Mean hourly velocity	11	6.5	6.2	5.9	6.4	5.2	5.2	5.0	5.1	4.8	5.0	6.6	6.1	5.7
Days with gales	7	0.0	0.6	0.0	0.0	0.3	0.4	0.1	0.6	0.6	0.0	0.6	0.0	3.2
Days with fog	7	1.9	1.6	1.6	0.4	0.4	0.1	0.0	0.0	0.1	0.6	0.1	0.7	7.5

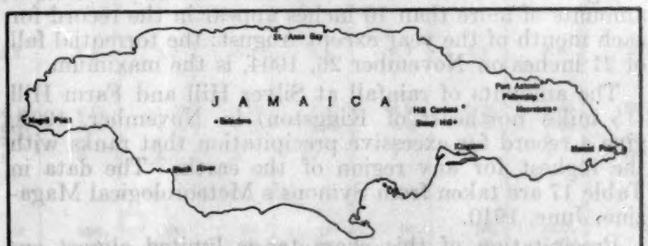
[a] Total for 11 years—January, 2.

JAMAICA

The distribution of stations at different elevations from near sea level to nearly 5,000 feet furnishes very interesting temperature data. Table 17 sets forth the main features relative to change in temperature with increased elevation.

TABLE 17.—*Mean annual temperatures at different elevations in Jamaica. (°F.). 16-year record*

Stations	Elevation	Mean Maximum	Mean Minimum	Mean
	Feet	*°F.*	*°F.*	*°F.*
Kingston	24	87.9	71.2	79.6
Hope Gardens	668	87.3	67.3	77.3
Stony Hill	1,400	82.5	66.3	74.4
Hill Gardens	4,900	68.4	56.0	62.2



Temperature.—Near sea level the mean annual temperature is 79° and it ranges down to 62° for the 5,000-foot level; for the warmest month this change in mean is from 82° to 65° and for the coldest from 77° to 59°. The maximum temperature observed near sea level is 98° (Kingston) and that for Hill Gardens, 80°; the minima are 57° and 44°, respectively.

Table 19, below, gives mean and extreme temperatures for six stations. All data refer to the period 1908–1923.

Relative humidity.—The mean annual relative humidity is 73 per cent at Kingston on the leeward coast, 82 per cent at Stony Hill (1,400 feet) and 87 per cent at Hill Gardens (4,900 feet). At the first two stations there is a considerable increase in relative humidity from the minima of July to the maxima of October–November, but at the third station the means show almost no change from month to month. The amplitude of daily variation as shown by means for 7 a. m. and 3 p. m. is moderately large at Kingston, but it is practically zero at Hill Gardens. Monthly and annual means appear in Table 20.

Precipitation.—The contrast in amount of precipitation received in different parts of the island is very striking. At Kingston, to leeward of the high Blue Mountains, the mean annual rainfall is only 32 inches; on the southwest coast (Black River), at the western extremity (Negril Point) and along the western half of the northern coast (St. Anns Bay) it amounts to 50–60 inches; at the eastern extremity (Morant Point) there is an increase to about 70 inches; in the west central region (Balaclava) a further rise to 80 inches. This progression continues as we enter the mountains and windward regions north and northeast of Kingston; here we find the following annual totals: One hundred and five inches at Hill Gardens, 140 inches at Port Antonio, 166 inches at Shrewsbury, 187 inches at Fellowship, and lastly the unusually heavy amount of 222 inches at Mooretown, in the valley of the Rio Grande, about 30 miles from Kingston.

The maximum rainfall occurs in October or November and the minimum from January to March. At Kingston the respective monthly averages for these periods are 7 and 1 inches, while at Mooretown they are 35 and 10 inches.

The rainfall normals in Table 20 are from "The Rainfall of Jamaica, 1870–1919," by Maxwell Hall; the maximum 24-hour amounts and the mean number of days with rain are compiled from the Jamaica Weather Report.

The following data relative to rainfall at Mooretown are of special interest. The total annual rainfall exceeded 300 inches in 1904 (320.84) and again in 1915 (309.03); monthly totals of 60 inches and over were recorded for November in the years 1899, 1901, 1904, and 1915, and for May in the year 1918, the extreme record being 69.36 inches in November, 1901. Twenty-four-hour amounts of more than 10 inches appear in the record for each month of the year except August; the torrential fall of 21 inches on November 26, 1904, is the maximum.

The amounts of rainfall at Silver Hill and Farm Hill (15 miles northeast of Kingston) in November, 1909, give a record for excessive precipitation that ranks with the highest for any region of the earth. The data in Table 17 are taken from Symons's Meteorological Magazine, June, 1910.

Precipitation of this character is limited almost entirely to the mountainous northeastern part of the island. In the Kingston record (1870–1924) there are a few instances in which the monthly rainfall was over 20 inches and some in which the 24-hour amount was 6 inches or more.

TABLE 18.—*Torrential precipitation in Jamaica in November, 1909*

Date	Silver Hill	Farm Hill	Radnor	Date	Silver Hill	Farm Hill	Radnor
	Inches	*Inches*	*Inches*		*Inches*	*Inches*	*Inches*
Nov. 4	6.50	4.20	(?)	Nov. 8	18.00	21.00	25.00
5	21.00	7.70	(?)	9	18.00	22.58	24.40
6	30.50	23.80	(?)	10	8.00	----------	28.00
7	27.00	38.50	(?)	11	6.00	6.62	(?)

TABLE 19.—*Temperature data for Jamaica.* (°F.)

MEAN MAXIMUM TEMPERATURE

Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Morant Point	16	81.2	81.3	81.9	83.0	84.4	85.4	86.0	86.5	86.7	85.8	83.7	82.2	84.0
Kingston	16	86.0	86.0	86.6	87.1	87.5	88.9	90.3	90.3	90.0	88.7	87.1	86.6	87.9
Negril Point	16	84.3	83.9	84.5	85.4	85.7	87.1	88.2	88.0	87.7	86.9	85.9	85.3	86.1
Hope Gardens	16	84.9	85.0	85.6	86.0	87.1	89.0	91.0	90.0	89.1	87.5	85.9	86.0	87.3
Stony Hill	16	79.9	80.5	81.2	82.0	82.6	84.4	85.8	85.0	83.6	82.9	81.1	80.8	82.5
Hill Gardens	16	65.6	65.4	66.4	67.4	68.4	69.9	72.0	71.9	70.6	69.0	67.3	66.7	68.4

MEAN MINIMUM TEMPERATURE

Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Morant Point	16	73.4	73.0	72.4	72.9	75.3	77.6	78.2	78.0	77.0	75.6	75.1	74.5	75.2
Kingston	16	67.8	67.6	68.4	70.3	72.4	73.5	73.5	73.6	73.5	73.0	71.2	69.2	71.2
Negril Point	16	68.3	67.7	68.1	70.1	71.8	72.6	72.5	72.6	73.1	72.8	71.4	69.7	70.9
Hope Gardens	16	64.2	63.8	64.7	66.5	68.1	69.1	69.3	70.1	70.1	69.1	67.5	65.4	67.3
Stony Hill	16	64.1	63.3	64.1	65.1	66.8	67.7	68.2	68.1	68.2	68.0	67.0	65.4	66.3
Hill Gardens	16	53.2	53.1	53.9	54.8	56.7	57.9	58.3	58.1	58.3	57.5	56.1	54.3	56.0

MEAN TEMPERATURE

Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Morant Point	16	77.3	77.2	77.2	78.0	79.8	81.5	82.1	82.2	81.8	80.7	79.4	78.4	79.6
Kingston	16	76.9	76.8	77.5	78.7	80.0	81.2	81.9	82.0	81.8	80.8	79.2	77.9	79.6
Negril Point	16	76.3	75.8	76.3	77.8	78.8	79.8	80.4	80.3	80.4	79.8	78.6	77.5	78.5
Hope Gardens	16	74.6	74.4	75.2	76.2	77.6	79.0	80.2	80.0	79.6	78.3	76.7	75.7	77.3
Stony Hill	16	72.0	71.9	72.6	73.5	74.7	76.0	77.0	76.6	75.9	75.4	74.0	73.1	74.4
Hill Gardens	16	59.4	59.2	60.2	61.1	62.6	63.9	65.2	65.0	64.4	63.2	61.7	60.5	62.2

HIGHEST TEMPERATURE

Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Morant Point	16	88	87	86	86	88	88	89	89	92	88	87	86	92
Kingston	16	92	92	92	94	94	95	95	98	96	95	93	92	98
Negril Point	16	90	89	90	91	92	92	93	92	92	93	94	92	94
Hope Gardens	16	93	91	92	93	94	95	97	97	96	94	93	92	97
Stony Hill	16	90	90	90	92	91	92	93	93	91	91	91	91	93
Hill Gardens	16	71	72	74	75	76	77	79	79	80	76	73	74	80

LOWEST TEMPERATURE

Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Morant Point	16	57	58	61	61	64	70	68	68	63	65	64	62	57
Kingston	16	57	60	62	64	66	68	68	70	69	68	62	62	57
Negril Point	16	57	61	62	63	61	66	68	69	69	68	62	62	57
Hope Gardens	16	57	58	59	60	61	62	61	64	64	62	60	55	55
Stony Hill	16	54	56	57	60	63	64	64	62	63	63	62	59	54
Hill Gardens	16	45	44	47	50	51	53	54	53	54	53	49	47	44

TABLE 20.—*Mean relative humidity (per cent), Jamaica*

Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Kingston:														
7 a. m.	16	83	82	81	78	77	77	77	78	82	86	86	85	81
3 p. m.	16	62	62	62	65	69	67	64	67	69	71	69	64	66
Mean	16	73	72	71	71	73	72	70	73	76	78	77	74	73
Stony Hill:														
7 a. m.	16	88	88	86	87	88	87	85	86	86	89	90	89	87
3 p. m.	16	77	73	72	76	80	75	70	74	78	81	81	78	76
Mean	16	82	81	79	81	84	81	78	80	82	85	85	84	82
Hill Gardens:														
7 a. m.	16	86	85	86	85	85	86	84	84	85	87	88	86	86
3 p. m.	16	87	87	86	89	88	88	87	85	89	91	91	89	88
Mean	16	86	86	86	87	86	87	86	84	87	89	90	88	87

TABLE 21.—*Precipitation data for Jamaica*

MEAN PRECIPITATION (IN INCHES)

Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Kingston	53	0.92	0.67	0.96	1.18	4.16	4.00	1.53	3.37	4.42	6.96	2.80	1.55	32.52
Black River	46	1.67	1.69	2.64	4.20	6.89	3.82	4.70	6.32	5.47	8.38	4.34	2.31	52.43
Negril Point	25	1.41	1.74	2.59	2.92	6.19	5.49	5.70	7.02	6.91	8.11	4.30	2.11	54.49
St. Anns Bay	28	4.97	4.76	2.85	4.16	5.69	4.03	3.01	2.91	3.47	6.93	10.13	7.84	60.75
Morant Point	50	4.38	2.89	2.15	3.53	9.35	6.21	3.40	5.25	7.02	11.66	8.24	6.11	70.19
Balaclava	27	1.94	2.21	4.89	10.10	12.78	4.84	4.67	7.45	11.01	12.73	6.30	2.61	81.53
Hill Gardens	49	6.98	4.07	4.88	5.98	10.43	7.62	3.64	8.38	9.84	17.20	16.16	10.30	105.48
Port Antonio	36	8.78	6.04	4.76	6.85	15.62	16.68	10.84	11.35	10.64	15.19	16.99	13.57	137.31
Shrewsbury *	23	17.08	11.36	8.52	10.30	14.84	11.98	9.29	8.71	9.25	13.35	30.70	21.12	166.50
Fellowship	28	13.08	10.47	7.31	10.29	18.54	20.08	15.06	14.01	13.12	17.63	27.59	20.04	187.22
Mooretown	24	17.48	12.92	9.78	11.76	18.97	21.77	17.72	15.54	15.39	19.92	34.65	26.08	221.98

MAXIMUM PRECIPITATION IN 24 HOURS (IN INCHES)

Kingston	30	1.52	1.82	1.28	1.78	6.84	6.27	4.40	3.12	6.45	6.49	8.93	3.62	8.93
Black River	26	2.72	(b)	(b)	3.41	3.88	3.60	4.23	4.50	5.48	6.62	3.70	3.69	6.62
Negril Point	29	3.39	(b)	(b)	3.35	6.59	5.53	3.53	5.70	9.07	9.05	12.79	(b)	12.79
St. Anns Bay	29	5.20	4.85	4.60	4.84	4.64	5.55	3.36	(b)	3.18	4.47	6.10	6.10	6.10
Morant Point	29	8.29	3.32	4.70	5.82	8.95	8.33	4.95	5.83	5.90	10.16	12.00	5.96	12.00
Balaclava	29	3.25	3.30	4.55	5.20	5.22	4.21	3.24	5.97	6.18	8.00	4.47	2.82	8.00
Hill Gardens	29	8.55	6.77	5.04	4.40	28.66	8.40	4.01	16.22	11.25	13.85	18.30	10.75	28.66
Port Antonio	29	6.18	7.49	4.07	7.47	14.51	15.70	9.84	10.93	10.47	11.04	16.12	18.26	18.26
Mooretown	15	10.68	11.05	10.02	10.60	15.42	13.12	10.10	7.65	10.00	11.15	21.00	11.50	21.00

MEAN NUMBER OF DAYS WITH PRECIPITATION

Kingston	25	5	3	5	5	7	6	5	8	9	11	7	5	76
Black River	15	7	6	9	10	12	8	10	14	12	14	10	6	118
Negril Point	15	7	8	10	9	14	14	14	15	15	14	10	8	138
St. Anns Bay	15	13	9	8	9	10	8	7	10	9	12	15	15	125
Morant Point	15	14	11	13	12	16	13	13	16	16	20	17	16	177
Balaclava	15	6	6	8	12	14	8	8	12	16	15	11	5	121
Hill Gardens	11	12	10	11	10	13	7	6	10	13	18	17	12	139
Port Antonio	15	16	13	12	11	15	16	14	17	12	15	17	16	174
Mooretown	15	16	13	13	12	14	17	16	15	13	14	17	18	178

* This station is in the vicinity of Port Antonio; exact location not available.
b Amount not in excess of 2.50 inches.

The following table for Kingston (18° 1′ N., 76° 48′ W., elevation 24 feet) is based mainly on the later series of observations beginning with the year 1908.

TABLE 22.—*Kingston, Jamaica*

	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	16	86.0	86.0	86.6	87.1	87.5	88.9	90.3	90.3	90.0	88.7	87.1	86.6	87.9
Mean minimum	16	67.8	67.6	68.4	70.3	72.4	73.5	73.5	73.6	73.5	73.0	71.2	69.2	71.2
Mean	16	76.9	76.8	77.5	78.7	80.0	81.2	81.9	82.0	81.8	80.8	79.2	77.9	79.6
Highest	16	92	92	92	94	94	95	95	98	96	95	93	92	98
Lowest	16	57	60	62	64	66	68	68	70	69	68	62	62	57
Relative humidity														
Mean, 7 a., 3 p	16	73	72	71	71	73	72	70	73	76	78	77	74	73
Cloudiness														
Mean, 7 a., 3 p	16	4.3	4.4	4.6	5.0	5.7	6.0	5.2	5.8	6.2	6.3	5.9	4.6	5.3
Precipitation														
Mean	53	0.92	0.67	0.96	1.18	4.16	4.00	1.53	3.37	4.42	6.96	2.80	1.55	32.52
Maximum in 24 hours	30	1.52	1.82	1.28	1.78	6.84	6.27	4.40	3.12	6.45	6.49	8.93	3.62	8.93
Days with rain	25	5	3	5	5	7	6	5	8	9	11	7	5	76
Days with thunder storms	5	1	1	(b)	(b)	6	6	8	10	12	5	2	3	54
Wind														
Prevailing direction:														
7 a. m.	16	nne.	n.	nne.	ne.	ne.	ene.	ne.	ne.	ne.	ne.	ne.	nne.	ne.
3 p. m.	16	se.	se.	se.	se.	se.	se.	se.	se.	se.	se.	se.	se.	se.
Mean hourly velocity *	16	6.7	7.4	7.7	7.9	8.5	9.8	9.5	8.3	6.8	6.5	6.0	6.1	7.6
Days with gales	37	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.2
Days with fog	37	0	0	0	0	0	0	0	0	0	0	0	0	0

* 7 a. m., 4.8 miles per hour, little change during the year; 3 p. m., 13.4 miles per hour, extremes 18.3 in July and 8.9 in November.
b Total for 5 years—March, 2; April, 2.

HAITI

In the Republic of Haiti, occupying the western part of the island of Haiti, the distribution of stations with temperature records is rather good, as follows: Port de Paix, Bayeux, and Cap Haitien, on the northern coast; Gonaives and Port au Prince, on the western, and Cayes, on the southern—all near sea level; in the southern interior are Ganthier and Petion Ville at elevations of 351 and 1,312 feet, respectively.

The following data for temperature and other meteorological elements are compiled from the bulletins of the *Séminaire-Collège, St. Martial*, Port au Prince (18° 33′ N., 74° 42′ W.; elevation, 60 feet).

Temperature.—In the west the mean annual temperature is 81° and in the north and south about 77°, while in the elevated interior it is 76°. The range in monthly mean temperature does not exceed 8° at any station. The maximum temperatures observed are 95° or below at Bayeux and Cap Haitien, but rise to about 100° elsewhere; the minimum temperatures are approximately within the limits 60° and 55°.

Precipitation.—North of Port au Prince the annual amounts of precipitation along the coast are very small, falling to 20 inches in the northwest. The eastern half of the northern coastal region receives much more rainfall; on the whole, the annual totals are between 40 and 60 inches, but there are local increases such as 82 inches at Bayeux. In the vicinity of Port au Prince the range in amount of annual rainfall is very striking, although not so marked as was noted for the region near Kingston, Jamaica: Ganthier, 32 inches; Petion Ville, 52 inches; Mirebalais, 103 inches. On the narrow southern peninsula the totals for the year are considerably different, with extremes of 30 and 84 inches at Tiburon and Cayes, both on the southern coast.

As a rule the greatest monthly precipitation occurs in May–June or September–November and the least in January or July; the maximum local monthly average exceeds 15 inches and the minimum falls below 0.50 inch. The extremes in days with rain annually are 135 at Bayeux and 43 at Gonaives. Maximum 24-hour amounts are not unusually high.

TABLE 23.—*Temperature data for Haiti.* (°F.)

MEAN MAXIMUM TEMPERATURE

Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Bayeux	6	79.3	79.9	81.3	83.1	84.7	86.7	88.3	88.3	88.0	86.7	83.3	80.4	84.2
Cap Haitien	7	79.9	79.3	80.4	82.0	84.4	86.4	86.7	87.4	87.4	85.5	82.4	80.2	83.5
Cayes	13	82.9	82.4	82.6	82.6	83.7	84.0	85.6	86.2	86.2	85.8	85.5	84.2	84.4
Ganthier	10	84.9	86.2	87.1	88.7	90.1	91.2	92.1	92.7	91.8	89.8	88.2	86.2	89.1
Gonaives	4	88.0	88.2	90.0	90.3	91.8	92.5	92.8	93.2	91.9	91.4	89.4	88.7	90.7
Petion Ville	11	83.7	84.0	85.5	85.8	86.4	87.8	89.8	89.2	87.8	85.8	84.0	82.8	86.0
Port au Prince	20	87.8	88.2	88.9	89.4	89.8	92.1	94.1	93.4	91.4	89.6	87.8	87.4	90.0
Port de Paix	5	81.3	81.3	83.3	86.2	88.5	90.5	90.7	90.1	89.4	89.1	86.7	83.8	86.7

MEAN MINIMUM TEMPERATURE

Bayeux	6	65.3	64.9	65.8	68.4	70.2	71.1	72.0	72.1	71.8	71.1	69.1	66.6	69.0
Cap Haitien	7	66.9	66.7	67.8	69.6	71.4	73.0	73.6	73.8	73.9	72.1	70.5	68.7	70.7
Cayes	13	68.7	68.9	70.0	71.8	73.2	74.7	74.5	74.5	74.1	73.2	72.0	69.6	72.1
Ganthier	10	64.8	66.6	67.5	69.3	71.2	72.1	72.9	72.7	72.0	71.1	69.1	66.6	69.7
Gonaives	4	68.0	67.6	69.4	70.3	72.1	72.7	73.4	72.3	72.1	71.6	71.1	68.0	70.7
Petion Ville	11	63.1	63.7	64.8	66.2	67.8	68.5	68.9	69.3	68.9	68.0	66.9	64.2	66.7
Port au Prince	20	68.2	68.5	69.4	70.9	72.5	73.4	73.8	73.4	72.9	72.1	71.2	69.3	71.3
Port de Paix	5	64.4	64.0	64.6	65.8	68.0	69.4	70.2	70.3	70.3	69.3	67.3	64.8	67.4

MEAN TEMPERATURE

Bayeux	6	72.3	72.4	73.6	75.8	77.4	78.9	80.2	80.2	79.9	78.9	76.2	73.5	76.6
Cap Haitien	7	73.4	73.0	74.1	75.8	77.9	79.7	80.2	80.6	80.6	78.8	76.4	74.4	77.1
Cayes	13	75.8	75.6	76.3	77.2	78.4	79.8	80.0	80.4	80.2	79.5	78.8	76.9	78.2
Ganthier	10	74.8	76.4	77.3	79.0	80.6	81.6	82.5	82.7	81.9	80.4	78.6	76.4	79.4
Gonaives	4	78.0	77.9	79.7	80.3	82.0	82.6	83.1	82.8	82.0	81.5	80.2	78.4	80.7
Petion Ville	11	73.4	73.8	75.2	76.0	77.1	78.2	79.4	79.2	78.4	76.9	75.4	73.5	76.4
Port au Prince	20	78.0	78.4	79.2	80.2	81.2	82.8	84.0	83.4	82.2	80.8	79.5	78.4	80.7
Port de Paix	5	72.8	72.6	74.0	76.0	78.2	80.0	80.4	80.2	79.8	79.2	77.0	74.8	77.0

HIGHEST TEMPERATURE

Bayeux	6	84	84	95	91	91	91	93	93	94	93	93	86	95
Cap Haitien	7	86	87	92	89	89	91	91	91	90	90	89	88	92
Cayes	13	89	89	91	95	90	89	90	99	92	93	92	91	99
Ganthier	10	92	94	96	95	95	98	97	99	99	98	96	92	99
Gonaives	4	93	96	96	96	96	98	100	99	99	96	95	93	100
Petion Ville	11	90	90	92	92	93	93	96	97	95	93	91	90	97
Port au Prince	25	93	95	98	98	99	99	100	100	99	98	96	93	100
Port de Paix	5	90	88	93	93	95	99	97	97	95	95	93	88	99

LOWEST TEMPERATURE

Bayeux	6	57	56	58	61	64	66	68	67	68	68	59	59	56
Cap Haitien	7	59	57	59	61	65	65	68	66	63	64	62	61	57
Cayes	13	59	59	62	65	66	70	71	69	69	69	64	62	59
Ganthier	10	57	57	58	60	63	64	68	67	65	66	60	54	54
Gonaives	4	58	58	64	67	65	68	68	67	67	67	65	61	58
Petion Ville	11	57	54	58	58	59	58	64	64	58	63	59	56	54
Port au Prince	25	62	59	63	61	66	64	68	68	67	66	64	60	59
Port de Paix	5	57	54	55	59	61	64	66	66	64	66	59	57	54

TABLE 24.—*Precipitation data for Haiti*

MEAN PRECIPITATION (IN INCHES)

Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Anse a Veau	13	1.53	2.04	2.42	4.55	6.41	5.42	4.38	4.75	4.53	3.56	2.82	1.17	43.58
Bayeux	18	6.59	4.67	4.57	7.28	8.21	4.35	1.80	3.61	5.55	8.76	15.21	11.08	81.68
Cap Haitien	14	4.59	4.84	3.76	2.68	4.83	3.72	1.32	1.69	3.65	9.33	10.39	9.01	59.81
Cayes	16	3.34	3.65	4.68	7.37	12.56	5.66	4.29	8.04	9.67	13.71	7.31	3.66	83.94
Ganthier	24	0.59	0.83	1.66	4.37	5.59	1.85	1.21	2.56	4.71	5.41	2.39	0.98	32.15
Gonaives	20	0.25	0.46	0.58	0.90	2.99	3.85	2.54	2.54	3.29	1.33	1.07	0.41	20.21
Jacmel	17	1.44	2.23	3.87	5.22	8.96	4.06	2.72	4.57	4.76	5.63	2.84	1.12	47.42
Jeremie	16	3.61	3.98	2.60	4.11	6.68	5.37	3.47	4.30	4.32	4.59	4.52	2.61	50.16
Mirebalais	10	0.68	2.02	3.33	6.54	14.47	12.88	11.84	14.23	15.66	12.72	6.18	2.56	103.11
Mole St. Nicholas	17	1.60	1.30	1.05	0.94	2.12	1.04	0.94	1.42	2.78	2.78	2.24	1.58	19.79
Petion Ville	24	1.07	1.91	3.70	6.95	8.55	4.35	2.92	4.54	7.73	6.23	2.91	1.07	51.93
Port au Prince	44	1.15	2.41	3.73	6.65	9.42	4.17	2.86	5.30	7.52	6.89	3.61	1.31	55.03
Port de Paix	16	5.33	3.59	2.07	2.59	3.31	3.65	2.11	3.55	5.43	4.69	7.59	5.50	49.41
St. Marc	12	0.43	1.22	0.77	1.35	5.40	5.59	5.52	5.33	5.34	4.11	1.06	0.48	36.60
St. Michel	15	0.35	0.54	1.61	2.75	7.40	8.31	4.33	5.88	6.26	5.45	2.52	1.02	46.42
Tiburon	9	1.73	1.30	2.61	4.49	2.74	0.37	1.55	2.80	4.15	4.32	3.47	1.08	30.61

TABLE 24.—*Precipitation data for Haiti*—Continued

MAXIMUM PRECIPITATION IN 24 HOURS (IN INCHES)

Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Cap Haitien	14	4.57	7.32	7.10	3.23	3.00	2.27	2.20	4.25	3.75	5.96	6.28	9.04	9.04
Cayes	14	3.11	4.60	3.84	4.25	7.74	5.93	6.15	8.66	4.28	6.63	5.35	6.54	8.66
Mirebalais	8	1.38	2.05	3.07	2.20	3.74	4.17	2.76	5.12	5.24	4.92	4.59	2.36	5.24
Mole-St.-Nicholas	14	2.80	2.60	1.77	2.09	3.10	1.83	1.64	5.08	2.40	5.39	3.25	1.50	5.39
Port au Prince	41	2.87	1.63	3.52	3.88	4.26	2.89	2.44	4.59	5.78	3.64	6.11	1.56	5.78

MEAN NUMBER OF DAYS WITH PRECIPITATION

Anse a Veau	13	4	3	6	8	12	11	10	10	10	9	6	3	92
Bayeux	14	13	10	9	10	12	10	6	7	12	15	17	14	135
Cap Haitien	14	6	6	5	5	8	5	4	3	6	10	11	7	76
Cayes	16	6	7	9	12	14	11	10	11	12	13	8	5	118
Ganthier	14	2	2	4	6	8	4	3	5	8	9	4	2	57
Gonaives	16	1	1	2	2	6	7	6	6	5	5	1	1	43
Jacmel	14	5	6	10	12	16	11	7	10	12	12	8	4	113
Jeremie	15	5	6	5	7	10	8	7	7	8	8	7	6	84
Mirebalais	8	2	3	6	10	16	15	14	18	17	16	8	4	129
Mole-St.-Nicholas	15	3	3	3	3	5	4	3	4	5	5	5	3	46
Petion Ville	14	3	4	8	11	14	9	7	9	13	12	7	3	100
Port au Prince	41	5	6	10	14	17	10	9	13	15	14	9	5	127
Port de Paix	16	10	7	6	4	7	6	5	7	9	8	11	10	90
St. Marc	11	1	2	2	3	9	12	10	11	10	8	2	2	72
St. Michel	14	1	2	3	5	11	12	7	8	9	9	4	2	73
Tiburon	9	5	4	7	10	6	2	6	9	10	12	7	4	82

The accompanying table for Port au Prince is based in large part on the valuable tabulations contained in several numbers of the bulletin issued by the meteorological observatory of the Seminaire-College, St. Martial, Port au Prince. The volumes for the years 1910, 1911, 1912, 1919, 1920, and 1921 furnish complete records of temperature and precipitation. Monthly records at Port au Prince for the years 1864–1869 and also annual records for the neighboring station of Leogane for the period 1761–1786 were published by Raulin in *Actes de l'Academie nationale des sciences, belles-lettres et arts de Bordeaux*, vol. 36, 1874. The mean for the 26-year period 1761–1786 is 53 inches, which is practically the same as that for the recent period of 44 years (55 inches).

TABLE 25.—*Port au Prince, Haiti*

	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	20	87.8	88.2	88.9	89.4	89.8	92.1	94.1	93.4	91.4	89.6	87.8	87.4	90.0
Mean minimum	20	68.2	68.5	69.4	70.9	72.5	73.4	73.8	73.4	72.9	72.1	71.2	69.3	71.3
Mean	20	78.0	78.4	79.2	80.2	81.2	82.8	84.0	83.4	82.2	80.8	79.5	78.4	80.7
Highest	25	93	95	98	98	99	99	100	100	99	98	96	93	100
Lowest	25	62	59	63	61	66	64	68	68	67	66	64	60	59
Relative humidity														
Mean, 7 a., 1 p., 9 p.	29	65	63	64	68	73	68	64	68	73	76	72	68	69
Cloudiness														
Mean, 3 observations	28	2.7	3.1	3.9	4.8	5.4	4.8	4.2	4.4	5.1	4.8	3.7	3.1	4.2
Sunshine														
Mean daily duration (hours)	25	8.8	9.0	9.0	8.5	8.1	8.1	8.8	8.7	7.8	7.3	8.2	8.2	8.4
Percentage of possible	25	79	79	75	68	63	62	67	68	64	62	73	74	70
Precipitation														
Mean	44	1.15	2.41	3.73	6.65	9.42	4.17	2.86	5.30	7.52	6.89	3.61	1.31	55.03
Maximum in 24 hours	41	2.87	1.63	3.52	3.88	4.26	2.89	2.44	4.59	5.78	3.64	6.11	1.56	5.78
Days with rain	41	5	6	10	14	17	10	9	13	15	14	9	5	127
Days with thunderstorm	13	1	1	3	5	13	15	16	17	20	15	6	2	114
Wind														
Prevailing direction*														
Mean hourly velocity	12	7.0	7.1	7.2	6.5	6.3	7.4	7.8	7.0	6.2	5.4	5.7	6.1	6.6

* The prevailing winds are from the west in the afternoon and in January–April the westerly direction frequently continues until 9 p. m.; they are from the east, or easterly at all other times.

DOMINICAN REPUBLIC

In the eastern part of the island of Haiti meteorological conditions are approximately the same as in the western Republic.

Miscellaneous data are available only for stations on the coasts: Puerto Plata (19° 49′ N., 70° 43′ W., elevation 40 feet), and Sanchez (19° 13′ N., 69° 37′ W., elevation 50 feet), at the north, and Santo Domingo (18° 28′ N., 69° 53′ W., elevation 60 feet) near the middle of the southern coast. The series of observations at Puerto Plata, for the period 1908–1922 published in the St. Martial (Port au Prince) bulletins is much longer than the later one reported to the Weather Bureau and is chosen to represent that station; the short series for 1910–1914 appearing in the *Annales* of the Meteorological Bureau of France is selected for Santo Domingo.

Near sea level the mean annual temperature is 78°, the means for January–March are about 74° and those for July–October are between 80° and 81.5°. Temperature extremes are approximately 95° and 55°.

TABLE 26.—*Puerto Plata, Dominican Republic*

	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	13	78.8	78.8	79.3	80.1	82.2	84.0	84.6	85.3	85.6	85.1	81.5	79.9	82.1
Mean minimum	13	70.2	69.6	70.3	71.4	73.9	76.1	76.8	77.4	76.8	76.1	74.1	71.4	73.7
Mean	13	74.5	74.2	74.8	75.8	78.0	80.0	80.7	81.4	81.2	80.6	77.8	75.6	77.9
Highest	13	87	87	88	89	91	94	91	91	92	91	89	87	94
Lowest	13	59	62	61	64	64	72	72	72	70	70	68	62	59
Cloudiness														
Mean, 7 a., 1 p., 9 p	9	4.0	4.0	3.7	3.9	3.6	3.4	3.4	3.3	3.1	3.1	4.3	4.1	3.7
Precipitation														
Mean	17	7.47	6.47	3.24	5.74	3.66	1.66	3.02	3.02	4.68	3.77	14.40	9.20	66.33
Maximum in 24 hours	13	8.74	9.65	5.51	3.94	3.94	2.24	2.16	4.13	3.31	4.13	10.75	10.83	10.83
Days with rain	13	15	11	12	10	9	6	9	8	7	8	13	16	124
Wind														
Prevailing direction, 8 a., 8 p.*	4	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.

* Weather Bureau series, 1918–1921.

TABLE 27.—*Sanchez, Dominican Republic*

	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean[a]	3	73.8	73.6	75.0	76.4	78.0	79.4	79.9	80.4	81.0	79.6	77.8	75.0	77.4
Highest	3	89	90	94	96	94	92	90	93	96	92	92	88	96
Lowest	3	60	60	58	62	64	68	68	70	68	66	64	60	58
Precipitation														
Mean	10	6.04	3.80	3.89	7.15	8.54	8.72	6.72	8.90	6.07	5.11	7.88	5.56	78.88

[a] Formula (maximum+minimum)÷2. (Series 1886-1888.)

TABLE 28.—*Santo Domingo, Dominican Republic*

	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	5	84.2	84.6	84.4	85.1	86.2	87.3	88.5	89.2	89.2	89.4	88.2	86.5	86.9
Mean minimum	5	66.2	65.7	66.6	68.4	70.2	71.4	71.6	72.0	71.8	71.1	70.0	68.4	69.4
Mean	5	75.2	75.2	75.5	76.8	78.2	79.4	80.0	80.6	80.5	80.2	79.1	77.4	78.2
Highest	5	89	89	88	89	91	93	94	95	94	93	93	92	95
Lowest	5	57	57	59	64	64	67	68	69	69	68	65	63	57
Relative humidity														
Mean, 6 a., noon, 9 p	5	81	77	78	78	80	81	81	82	82	82	82	82	80
Cloudiness														
Mean, 3 observations	5	4.4	4.4	4.3	4.9	5.0	4.9	4.4	4.5	4.3	4.3	4.3	4.4	4.5
Precipitation														
Mean [a]	14	2.07	1.20	2.75	3.68	5.06	5.76	7.22	6.67	7.22	7.29	4.25	2.29	55.46
Maximum in 24 hours [b]	10	1.51	0.65	2.78	6.20	5.00	2.40	4.78	5.41	5.09	7.42	2.53	0.98	6.20
Days with rain [b]	10	12	8	9	10	12	14	16	16	16	14	12	12	151
Wind														
Prevailing direction [c]	4													
Mean hourly velocity	2	4.8	5.4	5.5	5.6	5.0	4.7	5.1	5.3	5.0	4.5	5.4	5.8	5.2

[a] From Weather Bureau records 1898–1906 (broken) and 1919–1924 (broken) combined with those of the *Seminaire-Conciliar*.
[b] From Weather Bureau data noted above.
[c] North or northeast in all months: no data relative to daily march.

From the longer records the mean annual precipitation is found to be approximately between 60 and 80 inches for the northern coast region and river valleys; on the eastern half of the southern coast there is a decrease to 45 to 55 inches, and west of this region a further considerable decrease to slightly more than 20 inches. The greatest monthly amounts occur during the period from May to November and the averages exceed 8 inches at the north; the least amounts (excepting the values for Puerto Plata with minimum in June) occur from December to March, and at this time along the southwestern coast the total for the four months averages only 2 inches.

In Table 29 the rainfall stations are arranged from west to east in northern and southern groups.

TABLE 29.—*Mean precipitation (in inches) Dominican Republic*

Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Northern group														
Puerto Plata	17	7.47	6.47	3.24	5.74	3.66	1.66	3.02	3.02	4.68	3.77	14.40	9.20	66.33
La Vega	10	5.96	4.21	5.10	5.35	7.03	5.94	7.49	4.80	5.91	6.81	8.44	4.26	71.30
Riva	6	4.64	4.15	2.76	4.09	5.42	9.67	6.88	7.22	6.10	5.81	8.94	4.99	70.67
Sanchez	10	6.04	3.80	3.89	7.15	8.54	8.72	6.72	8.90	6.07	5.11	7.88	5.56	78.38
Southern group														
Barahona	4	0.74	0.36	1.34	1.91	5.11	2.90	1.08	1.10	3.10	4.12	*0.85	0.08	22.69
Azua	6	0.19	0.36	0.79	1.06	3.86	2.11	1.55	2.66	3.58	2.32	2.46	0.09	21.03
Santo Domingo	14	2.07	1.20	2.75	3.68	5.06	5.76	7.22	6.67	7.22	7.29	4.25	2.29	55.46
San Pedro de Macoris	14	2.12	1.65	1.57	1.86	3.70	4.73	3.74	5.82	7.55	4.86	4.24	2.53	44.37

* 20.96 inches reported in 1924, considered doubtful, and not included.

Records for 1915–1917 and 1921–1924 for other stations are found in the Revista de Agricultura (Santo Domingo), February, 1917, and in the annual numbers of Climatological Data, West Indies and Caribbean Service, U. S. Weather Bureau.

PORTO RICO

The tables for this island are taken from the copy now being prepared at the San Juan office of the U. S. Weather Bureau for the issue of a complete climatology of the island. The distribution of stations chosen is as follows: Coast stations at elevations of 100 feet or less—San Juan and Arecibo (north), Vieques Island (off eastern extremity), Humacao (east), Ponce (south), and Mayaguez (west), and the interior stations of Comerio Falls, Cayey, and Toro Negro Dam at elevations of 500, 1,350, and 2,275 feet, respectively.

Temperature.—The mean annual temperature is about 78° for the low stations, 73° at Cayey, and 69° at Toro Negro Dam. The range in monthly mean temperature from August and September to January and February is from 5° to 7°. The observed temperature extremes for stations near sea level are 101° at Arecibo and 51° at Mayaguez and those for the 2,300-foot level are 87° and 46°. At San Juan the extreme range in temperature is from 94° to 62°.

Precipitation.—In common with other mountainous islands of the West Indian region, Porto Rico shows marked changes in the amounts of rain received at stations separated by only a few miles. From north to south along a diagonal cross section 45 miles in length we find the following values (in inches) for mean annual precipitation: San Juan, 61; Comerio Falls, 79; Toro Negro Dam, 93; and Ponce, 35. The total yearly fall at the eastern and western extremities as represented by Humacao and Mayaguez is about 80 inches. As a rule precipitation is greatest in October or November and least in February, the means in these periods ranging from 6 to 15 inches and from 1 to 5 inches respectively. Days with rain show as an annual average values from only 92 at Ponce up to 213 at San Juan. Maximum precipitation in 24 hours runs fairly high, with an extreme of 14.90 inches at Humacao.

Wind.—The table of prevailing wind directions shows a shifting from northeast on the western coast (Mayaguez) to east on the northern and eastern coasts (San Juan and Humacao) and to southeast on the southern coast (Ponce). In the interior north of the divide the winds come from directions northeast to southeast, as, for example, at Cayey, while south of the divide they blow from the south, as at Toro Negro Dam.

TABLE 30.—*Temperature data for Porto Rico.* (°F.)

MEAN MAXIMUM

Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
San Juan	25	80.1	80.4	80.6	82.0	84.0	84.9	85.0	85.4	85.9	85.5	83.6	81.4	83.2
Cayey	19	79.6	79.9	81.0	82.7	84.1	84.6	85.6	86.2	86.2	85.6	84.0	81.3	83.4
Toro Negro Dam	9	74.1	74.3	74.6	74.6	76.1	77.9	79.6	81.1	78.8	78.1	77.1	75.5	76.8
Mayaguez	24	85.8	86.2	86.6	87.5	88.4	89.1	89.1	90.1	90.6	89.9	88.3	86.9	88.2

TABLE 30.—*Temperature data for Porto Rico.* (°F.)—Continued

MEAN MINIMUM

Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
San Juan	25	69.6	69.4	69.9	71.2	73.1	74.4	74.9	75.3	74.9	74.2	72.8	71.1	72.6
Cayey	19	58.4	58.7	58.9	60.3	63.4	65.0	65.7	66.1	65.5	64.4	62.6	60.3	62.4
Toro Negro Dam	9	58.5	57.5	57.8	58.0	61.5	62.7	62.8	64.3	62.8	62.3	61.3	59.7	60.8
Mayaguez	24	62.6	62.2	62.2	64.1	66.8	67.9	68.3	68.1	68.0	68.1	66.7	64.5	65.8

MEAN

San Juan	25	74.9	75.0	75.2	76.6	78.0	79.7	79.9	80.4	80.4	79.8	78.2	76.2	77.9
Arecibo	21	74.3	74.8	75.3	76.7	78.7	79.8	80.0	80.6	80.6	80.1	78.2	75.9	77.9
Cayey	19	69.0	69.3	70.0	71.5	73.8	74.8	75.7	76.1	75.9	75.0	73.3	70.8	72.9
Comerio Falls	18	82.6	73.0	73.0	74.8	77.8	78.5	78.8	79.0	79.1	78.4	76.7	74.4	76.3
Humacao	18	73.7	74.0	74.8	76.2	78.1	79.2	79.7	80.2	79.7	79.0	77.4	75.0	77.2
Mayaguez	24	74.2	74.2	74.4	75.8	77.6	78.5	78.7	79.1	79.3	79.0	77.5	75.7	77.0
Ponce	19	75.2	75.2	75.9	77.4	79.4	80.5	80.8	81.5	81.1	80.3	78.9	76.8	78.6
Toro Negro Dam	9	66.3	65.9	66.2	66.4	68.9	70.3	71.2	72.7	70.8	70.2	69.2	67.6	68.8
Vieques Island	23	76.4	76.7	77.5	78.4	79.9	80.8	81.4	81.7	81.4	80.7	79.0	77.4	79.3

HIGHEST

San Juan	25	87	90	90	93	94	93	91	91	94	93	91	88	94
Arecibo	23	94	96	96	95	98	99	99	97	101	100	98	98	101
Cayey	19	91	87	91	91	92	93	92	94	92	90	92	88	94
Comerio Falls	18	90	97	98	94	96	97	95	98	96	99	97	94	99
Humacao	18	94	93	96	98	92	97	95	96	96	96	97	95	98
Mayaguez	24	91	93	95	98	97	96	96	97	97	99	98	96	99
Ponce	19	90	90	90	93	95	96	95	96	95	95	94	91	96
Toro Negro Dam	9	83	81	82	82	82	85	86	86	86	86	87	85	87
Vieques Island	23	92	93	94	91	94	95	94	98	98	99	97	95	99

LOWEST

San Juan	25	63	62	63	65	66	66	70	68	69	68	66	62	62
Arecibo	23	52	52	52	55	54	58	60	61	60	58	58	55	52
Cayey	23	44	44	46	49	50	51	58	58	58	56	52	48	44
Comerio Falls	18	50	50	53	55	61	63	62	66	61	61	59	56	50
Humacao	18	54	53	53	52	58	55	66	65	65	60	60	54	52
Mayaguez	24	51	52	55	57	57	59	60	58	60	61	58	55	51
Ponce	19	57	55	58	59	61	58	58	64	68	61	60	57	55
Toro Negro Dam	9	46	51	48	50	54	56	56	57	56	53	53	51	46
Vieques Island	23	61	62	64	63	65	64	67	68	68	66	64	62	61

TABLE 31.—*Precipitation data for Porto Rico*

MEAN PRECIPITATION (IN INCHES)

Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
San Juan	25	4.15	2.71	2.98	4.10	5.28	5.31	5.68	5.99	6.20	5.58	6.86	5.80	60.64
Arecibo	21	5.72	3.91	4.06	4.46	5.92	3.48	5.07	4.47	4.73	4.95	8.89	5.86	61.52
Cayey	25	3.30	2.90	3.00	3.61	4.53	6.14	6.38	6.34	6.27	6.59	6.13	4.41	59.60
Comerio Falls	17	6.95	4.56	5.14	5.73	6.41	4.88	7.52	7.88	7.41	6.54	8.71	7.58	79.31
Humacao	25	4.20	3.32	3.86	4.60	8.74	8.93	8.27	8.48	10.28	9.69	8.45	5.25	84.07
Mayaguez	25	1.87	2.27	3.36	5.51	7.87	8.74	11.05	11.47	10.52	9.44	6.09	2.81	81.00
Ponce	23	1.03	0.97	1.42	2.14	2.91	3.85	2.89	4.19	4.92	6.72	3.47	1.36	35.83
Toro Negro Dam	13	3.97	4.79	4.01	7.96	8.68	6.53	7.18	6.70	12.78	15.22	9.88	4.95	92.65
Vieques Island	25	3.04	2.53	2.28	2.75	3.73	4.44	4.33	4.48	6.24	6.33	5.30	3.67	49.12

MAXIMUM PRECIPITATION IN 24 HOURS (IN INCHES)

San Juan	25	3.07	4.84	2.83	6.72	4.81	5.26	4.05	6.26	6.40	3.35	5.52	10.55	10.55
Arecibo	21	4.20	4.10	5.05	6.50	4.00	2.70	2.30	2.45	2.90	2.60	8.00	4.00	8.00
Cayey	25	1.60	2.20	3.00	4.30	4.00	6.83	4.52	9.00	6.47	7.00	7.65	4.65	9.00
Comerio Falls	17	4.50	3.10	2.55	3.71	3.76	3.22	3.65	5.71	10.00	2.40	5.00	6.80	10.00
Humacao	25	2.20	2.77	3.76	6.60	9.84	5.38	5.50	6.16	14.90	5.74	10.42	3.92	14.90
Mayaguez	25	1.77	2.43	2.69	4.07	4.06	4.05	3.60	8.40	9.50	7.18	4.08	3.00	9.50
Ponce	23	1.52	0.87	1.90	1.80	2.20	3.11	2.45	4.05	4.45	7.68	5.01	2.20	7.68
Toro Negro Dam	13	2.60	3.14	2.60	7.56	3.60	4.07	6.10	6.00	5.10	8.00	6.10	3.82	8.00
Vieques Island	25	1.54	3.92	1.88	8.00	4.10	4.00	6.00	8.05	10.00	3.99	6.26	3.98	10.00

MEAN NUMBER OF DAYS WITH PRECIPITATION

San Juan	25	20	15	17	14	16	17	20	19	18	17	19	21	213
Arecibo	21	13	9	9	9	11	9	12	11	11	13	14	13	134
Cayey	25	16	12	13	10	11	13	14	14	13	15	16	17	164
Comerio Falls	17	19	15	16	14	15	15	19	18	18	18	18	20	205
Humacao	25	15	12	14	12	18	19	19	19	18	18	17	15	196
Mayaguez	25	8	8	9	13	15	15	18	19	18	17	13	10	163
Ponce	23	6	4	6	7	9	7	7	9	10	13	8	6	92
Toro Negro Dam	13	12	11	11	12	16	13	15	15	18	21	18	13	175
Vieques Island	25	14	12	12	9	12	14	15	15	14	14	15	15	161

TABLE 32.—*Prevailing wind directions, Porto Rico*

Stations	Length of record, year	January	February	March	April	May	June	July	August	September	October	November	December	Annual
San Juan [a]	25	e.	e.	e.	e.	e.	e.	e.	e.	e.,se.	e.	e.	e.	e.
Cayey [b]	8	ne.	e.	ne.	e.	e.	e.	e.	e.	e.	se.	se.	e.	e.
Humacao	5	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.
Mayaguez	22	ne.	ne.	ne.	ne.	ne.	se.	n.	ne.	ne.	se.	ne.	ne.	ne.
Ponce	16	se.	se.	se.	se.	se.	se.	se.	se.	se.	se.	se.	se.	se.
Toro Negro Dam	13	n.	s.	s.	s.	s.	s.	s.	s.	s.	s.	s.	n.	s.
Vieques Island	23	e.	e.	e.	e.	s.	e.	e.	e.	s.	s.	e.	e.	e.

[a] Automatic record for 24 hours.
[b] From eye observations during daylight hours at Cayey and remaining stations.

Miscellaneous meteorological data for San Juan (18° 29′ N., 66° 7′ W., elevation 100 feet) appear in the following table:

TABLE 33.—*San Juan, Porto Rico*

	Length of record years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	25	80.1	80.4	80.6	82.0	84.0	84.9	85.0	85.4	85.9	85.5	83.6	81.4	83.2
Mean minimum	25	69.6	69.4	69.9	71.2	73.1	74.4	74.9	75.3	74.9	74.2	72.8	71.1	72.6
Mean	25	74.9	75.0	75.2	76.6	78.6	79.7	79.9	80.4	80.4	79.8	78.2	76.2	77.9
Highest	25	87	90	90	93	94	93	91	91	94	93	91	88	94
Lowest	25	63	62	63	65	66	66	70	68	69	68	66	62	62
Relative humidity														
Mean, 9 a., 9 p.	11	79	78	76	76	77	79	78	79	80	81	81	80	
Mean, noon	6	74	75	73	75	74	76	78	76	76	76	75	76	79
Cloudiness														75
Mean, daylight hours	25	4.5	4.2	4.1	4.6	5.3	5.4	5.5	4.6	5.3	5.0	4.8	4.7	4.8
Sunshine														
Mean daily duration (hours)	25	6.9	7.8	8.2	7.8	7.6	7.7	8.1	8.4	7.4	7.3	6.9	6.8	7.6
Precipitation														
Mean	25	4.15	2.71	2.98	4.10	5.28	5.31	5.68	5.99	6.20	5.58	6.86	5.80	60.64
Maximum in 24 hours	25	3.07	4.84	2.83	6.72	4.81	5.26	4.05	6.26	6.40	3.35	5.52	10.55	10.55
Days with rain	25	20	15	17	14	16	17	20	19	18	17	19	21	213
Days with thunderstorm	25	(a)	(a)	(a)	1	5	7	7	7	10	8	3	1	49
Wind														
Prevailing direction	25	e.	e.	e.	e.	e.	e.	e.	e.	e, se.	e.	e.	e.	e.
Mean hourly velocity:														
Station I [b]	13	11.2	11.0	11.3	11.2	10.7	12.1	12.5	11.7	9.4	7.8	8.8	10.1	10.6
Station II [c]	11	14.7	13.2	15.1	13.3	12.3	12.2	14.7	14.0	10.0	8.6	10.4	12.7	12.6
Maximum velocity	25	54	48	48	44	39	50	52	*92	72	52	50	48	92
Direction at maximum velocity		ne.	nw.	e.	e.	ne.	se.	ne.	ne.	ne.	n.	ne.	e.	ne.
Days with gales [d]	18	0.7	0.2	0.1	0.2	0.0	0.1	0.3	0.6	0.3	0.2	0.4	0.1	3.2
Days with fog [d]	18	0	0	0	0	0	0	0	0	0	0	0	0	0

*Aug. 22, 1916.
[a] For the period of 25 years the totals for January, February, and March are 4, 4, and 7, respectively.
[b] In San Juan proper; elevation, 90 feet; winds modified by higher land and buildings.
[c] In Puerta de Terra; elevation, 54 feet; open exposure.
[d] The West Indies Pilot, Vol. II, seventh edition (1920).

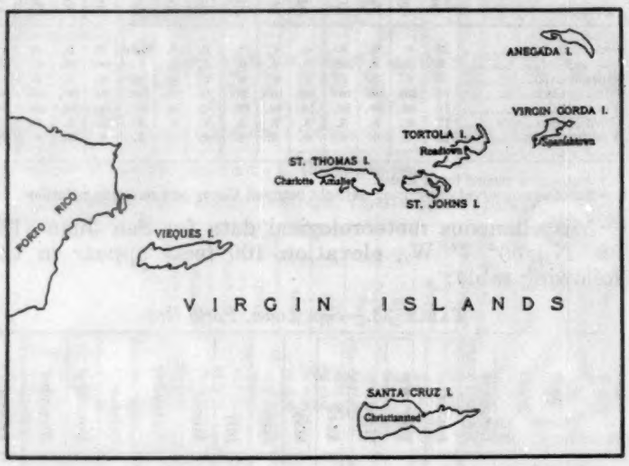
VIRGIN ISLANDS

The series of meteorological observations at Charlotte Amalie, St. Thomas (18° 13′ N., 64° 29′ W., elevation 27 feet), and Christiansted, St. Croix (17° 45′ N., 62° 42′ W., elevation 82 feet) furnish rather complete data on conditions in this region.

The table for Charlotte Amalie is based largely on recent observations by the Weather Bureau; that for Christiansted on data published in yearbooks of the Danish Service.

The mean annual temperature is 79.5°, with monthly means from about 82.5° in August to 77° in January and February. The temperature extremes for the period of 33 years shown by the Christiansted record are 96° and

64°. Relative humidity increases from 72 per cent in March and April to 78 per cent in October and November; cloudiness, however, reaches an earlier maximum of 4.4 in June.



The average amount of rain received annually is from 40 to 50 inches. Local monthly means fall below 2 inches near the first of the year; beginning with May, there is a rather uniform increase in precipitation which reaches the maximum in October or November, when it is about 6 to 7 inches.

TABLE 34.—*Charlotte Amalie, St. Thomas*

	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	7	82.3	82.3	82.3	83.0	84.7	86.0	87.0	87.9	87.8	87.2	86.1	83.4	85.0
Mean minimum	7	71.8	72.0	72.0	73.5	75.7	77.0	77.2	77.9	76.8	76.3	75.2	73.0	74.9
Mean	7	77.0	77.2	77.2	78.2	80.2	81.5	82.1	82.9	82.3	81.8	80.6	78.2	79.9
Highest	7	88	88	87	89	88	90	90	92	92	92	91	89	92
Lowest	7	66	63	67	68	71	71	70	70	72	71	70	66	67
Precipitation														
Mean	17	2.71	1.87	2.41	1.89	2.66	3.19	3.09	3.38	5.44	6.15	4.99	3.16	40.89
Maximum in 24 hours	7	1.40	1.60	2.16	1.90	2.40	1.26	2.75	4.65	2.90	5.30	2.65	1.58	5.30
Days with rain	7	18	15	16	13	13	18	18	19	17	19	19	20	205

TABLE 35.—*Christiansted, St. Croix*

	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	17	80.8	80.8	81.7	82.8	84.9	85.6	85.8	86.2	86.5	85.8	84.2	82.0	83.9
Mean minimum	17	72.3	71.8	72.1	73.6	75.6	76.6	77.0	77.5	77.0	76.3	75.2	73.6	74.9
Mean	17	76.6	76.3	76.9	78.2	80.2	81.1	81.4	81.8	81.8	81.0	79.7	77.8	79.3
Highest	33	86	87	91	91	95	96	94	91	91	91	92	91	96
Lowest	33	65	66	64	67	69	69	70	70	69	69	69	65	64
Relative humidity														
Mean, 8 a., 2 p., 9 p.	17	74	73	72	72	74	76	74	75	77	78	78	77	75
Mean, 2 p.	4	68	70	65	68	72	69	69	69	70	72	75	72	70
Cloudiness														
Mean, 3 observations	19	3.7	3.5	3.5	3.7	4.0	4.4	4.3	3.9	4.0	3.9	3.7	3.7	3.9
Precipitation														
Mean	37	2.32	0.05	1.24	2.97	4.39	4.53	3.46	4.26	5.59	5.88	5.89	3.87	46.43
Days with rain	37	13	10	7	8	11	11	12	12	12	13	14	13	136
Days with thunderstorm	19	(a)	(a)	(a)	(a)	2	2	2	3	2	3	1	1	16
Wind														
Prevailing direction, 3 observations	4	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.

[a] For period of 19 years the totals for the months January–March are 4, 1, 1, and 8, respectively.

TABLE 36.—*Mean precipitation (in inches), Virgin Islands*

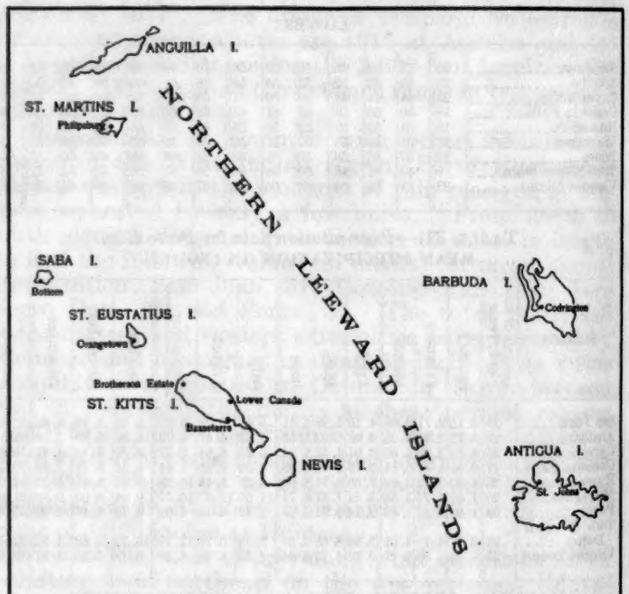
Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Charlotte Amalie	17	2.71	1.87	2.41	1.89	2.66	3.19	3.09	3.38	5.44	6.15	4.99	3.16	40.89
Christiansted	37	2.30	2.05	1.24	2.97	4.39	4.53	3.46	4.26	5.59	5.88	5.89	3.87	46.43
Tortola [a]	24	3.10	2.92	2.23	2.50	4.24	4.25	4.20	4.15	4.93	7.15	7.02	4.76	51.45
Virgin Gorda [b]	12	2.10	2.40	1.28	1.59	3.12	3.15	2.09	3.23	3.64	4.51	5.69	3.53	36.33

[a] Botanic station at Roadtown. Means from Report on the Agricultural Department, Tortola, Virgin Islands, 1919–20, revised to include 1924.
[b] Spanishtown.

NORTHERN LEEWARD ISLANDS [1]

In this group lying north of Guadeloupe are situated four stations with rather complete data: Orangetown, St. Eustatius (17° 29′ N., 62° 59′ W.); Basseterre, St. Kitts (17° 20′ N., 62° 44′ W., elevation 29 feet); St. Johns, Antigua (17° 10′ N., 61° 51′ W., elevations 25 to 80 feet); and Plymouth, Montserrat (16° 41′ N., 62° 9′ W., elevation 130 feet).

Interesting papers on the climate of this region are found in the MONTHLY WEATHER REVIEW as follows: St. Kitts, Annual Summary, 1899 and November, 1900; Antigua, April, 1901.



The data for Orangetown given here are from the *Encyclopaedia van Nederlandsch West-Indie*, p. 411; those for Basseterre are compiled from more detailed records following the period used in the papers mentioned above, and those for St. Johns are copied almost entirely from the MONTHLY WEATHER REVIEW of April, 1901.

The mean annual temperature for the region is from 77° to 80°. The lower mean at Orangetown is due to comparatively low maximum temperatures—mean maximum 81° as against 86° at St. Johns; highest observed maximum only 88°. Relative humidity gradually increases from March to November, with a range of 8 per cent.

[1] This designation conveniently includes in one division the small islands belonging to Great Britain and Holland.

East winds prevail throughout the year; the maximum hourly velocity is slightly above 10 miles (July) and the minimum 5 to 7 (October).

Over the greater part of this region the mean amount of rainfall received annually is from 40 to 50 inches, but at Plymouth, Montserrat, and stations in the northern part of St. Kitts there is an increase to 70 inches and over (Brotherson, 85 inches). The annual march of precipitation is practically the same as in regions previously considered—maximum in September–November, minimum in February–March.

TABLE 37.—*Orangetown, St. Eustatius*

	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	5	77.2	77.5	78.1	79.2	80.8	82.0	82.4	83.5	82.9	82.4	81.5	79.5	80.6
Mean minimum	5	71.1	70.9	71.1	72.5	73.2	75.2	75.6	76.1	75.9	75.2	74.7	73.0	73.7
Mean	5	74.2	74.2	74.6	75.8	77.0	78.6	79.0	79.8	79.4	78.8	78.1	76.2	77.1
Highest	5	83	86	83	83	88	86	86	88	88	88	86	86	88
Lowest	5	67	64	66	68	66	70	72	72	71	69	70	69	64
Cloudiness														
Mean	5	3.2	3.6	2.7	3.1	3.6	3.6	3.2	3.3	3.1	3.0	2.9	3.1	3.2
Precipitation														
Mean	44	2.58	1.97	1.81	2.11	3.50	3.56	4.01	4.57	4.95	5.15	4.88	3.45	42.54

TABLE 38.—*Basseterre, St. Kitts*

	Length of records, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	13	81.5	81.3	81.4	82.6	84.0	85.1	85.7	86.4	86.4	86.1	85.0	82.7	84.0
Mean minimum	13	71.4	71.2	71.1	72.8	74.6	75.5	75.9	76.3	75.9	75.1	74.1	72.3	73.8
Mean	13	76.4	76.2	76.2	77.7	79.3	80.3	80.8	81.4	81.1	80.6	79.6	77.5	78.9
Highest	13	86	85	88	87	87	88	88	89	92	90	90	88	92
Lowest	13	64	66	64	67	67	68	68	67	67	68	64	64	64
Relative humidity														
Mean, 8 a., 8 p.	4	76	74	70	74	76	77	76	77	78	78	78	75	76
Cloudiness														
Mean, 2 observations	4	4.8	4.4	4.4	4.8	5.6	6.1	5.3	5.0	5.2	5.0	4.8	4.3	5.0
Precipitation														
Mean	56	3.48	1.95	2.11	3.18	3.90	4.02	4.34	5.37	6.38	6.11	5.22	3.67	49.73
Maximum in 24 hours	13	2.80	1.98	1.45	2.50	3.10	4.60	2.21	10.60	5.50	4.80	6.69	2.25	10.60
Days with rain	21	17	14	13	12	14	17	18	18	18	18	16	18	193
Days with thunderstorm	4	0	0	0	(a)	3	3	2	1	4	4	2	1	20
Wind														
Prevailing direction	4	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.
Mean hourly velocity	4	10.0	9.7	10.3	9.7	9.0	10.4	11.1	10.7	9.3	6.9	8.3	8.7	9.5
Maximum velocity	4	27	34	24	32	27	34	42	*72	62	42	34	29	72
Direction at maximum	----	e.	e.	e.	s.	sw.	s.	se.	ne.	sw.	sw.	sw.	se.	ne.

[a] Aug. 7, 1899.

[b] Total for period of 4 years, 1.

TABLE 39.—*St. Johns, Antigua*

	Length of records, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	11	83.7	83.4	84.0	85.0	85.9	86.9	87.2	88.1	88.2	87.7	85.9	85.0	85.9
Mean minimum	11	70.2	70.1	70.5	72.0	73.7	75.2	75.4	75.9	74.8	74.2	73.0	71.5	73.0
Mean	11	76.9	76.8	77.2	78.4	79.8	81.1	81.3	82.0	81.5	80.6	79.4	78.2	79.5
Highest	11	88	89	90	92	90	91	92	92	93	93	92	90	93
Lowest	11	61	60	60	60	66	69	69	70	69	67	65	63	60
Relative humidity														
Mean, 9 a., 3 p.	11	69	66	64	67	70	70	71	70	72	72	73	71	70
Precipitation														
Mean	50	3.25	2.24	2.24	3.20	4.26	3.97	4.65	4.71	5.68	5.74	5.54	3.90	49.38
Days with rain	11	23	18	16	14	17	20	24	22	21	22	23	22	242
Days with thunderstorm	11	(a)	(a)	(a)	(a)	1	2	3	2	3	3	1	(a)	15
Wind														
Prevailing direction	11	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.
Mean hourly velocity	11	8.1	8.6	8.7	8.6	8.7	9.9	10.2	9.0	6.6	5.0	6.4	5.7	8.0
Days with gales	26	0	0	0	0	0	0	0	(b)	(b)	0	0	0	0.1
Days with fog	26	0	0	0	0	0	0	0	0	0	0	0	0	0

[a] Totals for the 10-year period are: January, 2; February, 0; March, 2; April, 2; and December, 2.

[b] Totals for 26-year period are: August, 1; September, 1.

TABLE 40.—*Plymouth, Montserrat*

	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	4	82.0	83.0	85.0	87.0	88.0	89.0	88.0	89.0	89.0	88.0	86.0	84.0	87.0
Mean minimum	4	70.0	69.0	70.0	72.0	74.0	75.0	75.0	75.0	74.0	73.0	72.0	71.0	73.0
Mean	4	76.0	76.0	78.0	79.0	81.0	82.0	82.0	82.0	81.0	81.0	79.0	77.0	80.0
Highest	4	89	91	93	93	93	94	94	96	97	92	92	89	97
Lowest	4	62	63	64	63	68	71	70	70	68	67	67	64	62
Relative humidity														
Mean, 9 a., 3 p.	4	69	68	64	63	66	66	68	68	69	71	72	70	68
Cloudiness														
Mean, 2 observations	4	6.0	6.0	5.0	6.0	6.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	6.0
Precipitation														
Mean	4	4.62	3.99	2.99	3.85	4.45	4.95	6.62	7.34	8.14	9.44	6.75	5.85	68.99
Maximum in 24 hours	4	1.08	1.00	1.08	1.33	1.75	1.56	1.41	3.96	5.50	7.59	2.51	1.28	7.59
Days with rain	4	19	23	17	16	20	20	23	23	21	23	22	22	249
Wind														
Prevailing direction	4	ne.	e.	se.	e.	se.	se.	se.	se.	se.	se.	se.	e.	se.
Mean hourly velocity	2	9.8	11.0	11.1	6.9	8.4	9.2	12.2	9.1	6.2	6.0	7.0	8.8	8.8
Days with fog	4	0.0	0.5	0.3	0.0	0.7	0.3	0.3	0.3	0.0	0.0	0.5	0.0	2.9

TABLE 41.—*Mean precipitation (in inches), Northern Leeward Islands*

Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
St. Martin														
Philipsburg *	31	2.44	1.69	1.30	2.32	4.06	2.95	3.03	4.45	5.83	4.80	5.39	3.23	41.49
Saba														
Bottom *	25	3.41	2.76	2.04	2.06	3.68	3.00	3.42	3.62	4.79	5.96	5.75	4.09	44.58
Barbuda														
Codrington	14	2.42	1.46	2.06	2.43	2.83	2.00	3.55	2.75	4.19	6.17	6.28	4.74	40.88
St. Eustatius														
Orangetown *	44	2.58	1.97	1.81	2.11	3.50	3.56	4.01	4.57	4.95	5.15	4.88	3.45	42.54
St. Kitts														
Basseterre	56	3.48	1.95	2.11	3.18	3.90	4.02	4.34	5.37	6.38	6.11	5.22	3.67	47.93
Brotherson	5	4.33	2.69	2.58	4.28	7.42	7.26	8.39	7.86	10.48	7.94	13.52	5.76	85.21
Lower Canada	18	2.47	1.57	1.66	2.56	4.31	3.78	3.94	5.76	5.96	4.91	5.05	3.04	45.01
Antigua														
St. John	50	3.25	2.24	2.24	3.20	4.26	3.97	4.65	4.71	5.68	5.74	5.54	3.90	49.38
Montserrat														
Plymouth	4	4.62	3.99	2.99	3.85	4.45	4.95	6.62	7.34	8.14	9.44	6.75	5.85	68.99

* Climatological Data, West Indies and Caribbean Service. July, 1925.

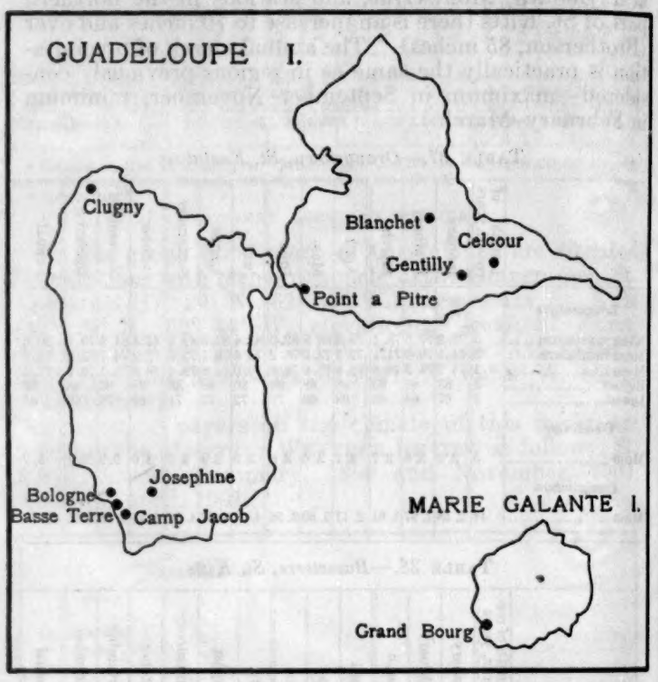
GUADELOUPE

The climatic tables given here are taken from papers appearing in the *Annales* of the French Meteorological Service, 1885, Part IV and 1901, Part I. These cover the period 1879–1884 for Point a Pitre (16° 14′ N., 61° 31′ W., elevation 15 feet) and the period 1891–1900 for Camp Jacob (16° 1′ N., 61° 42′ W., elevation 1,750 feet), and give rainfall data for other stations. Later issues of this publication contain records for Camp Jacob, but on account of change of location and elevation the resulting somewhat broken series has not been combined with the former.

Temperatures at Point a Pitre are practically the same as at Basseterre and St. Johns, in the northern Leeward Islands. At the rather elevated station of Camp Jacob, near the southern end of the island, the mean annual temperature is 72°, or 7° below that for sea level. The extremes for mean monthly temperature are 75° in August and 69° in February. During the 10-year period the highest temperature was only 87° and readings of 60° or lower were recorded in all months except September.

Relative humidity presents the usual annual curve, with minimum about March and maximum in October and November; cloudiness shows the maximum from June to August.

In the western part of the island, Basse Terre, precipitation shows the following range in annual amount: Forty-nine inches at Bologne, on the southwest coast near Basse Terre; 81 inches at Clugny, on the northern coast; 121 inches at Josephine, and 156 inches at Camp Jacob, in the southern interior, the last two places being at elevations of 1,970 and 1,750 feet, respectively. In the eastern part of the island, Grande Terre, the



amount of rain received in the year is generally from 50 to 70 inches, but at Gentilly, near the southern coast, there is the marked rise to 145 inches. In contrast to the island regions immediately to the north the annual march presents the maximum somewhat earlier—July to September—but rainfall continues heavy until November.

TABLE 42.—*Point a Pitre, Guadeloupe*

	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	6	80.4	80.8	82.0	83.8	85.6	86.5	86.9	86.7	86.5	85.6	83.3	81.1	84.1
Mean minimum	6	69.1	68.4	69.4	72.1	75.4	76.8	76.5	76.1	75.7	74.3	73.2	69.6	73.0
Mean	6	74.8	74.6	75.7	78.0	80.5	81.6	81.7	81.4	81.1	80.0	78.2	75.4	78.6
Highest	6	85	85	87	88	89	90	90	90	90	90	87	85	90
Lowest	6	61	62	63	66	71	72	72	72	64	64	66	63	61
Relative humidity														
Mean, 8 a., 4 p.	3	82	81	79	78	80	80	81	81	82	83	84	83	81
Precipitation														
Mean	19	5.20	3.27	3.99	3.82	6.97	9.37	10.28	10.39	10.24	10.08	9.84	8.35	91.80
Days with rain*	4	17	13	9	11	15	16	16	18	15	20	15	15	180

* 0.04 inch (1 mm.) or more.

TABLE 43.—*Camp Jacob, Guadeloupe*

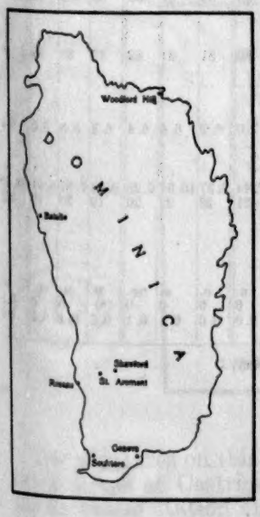
	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	10	75.2	74.8	75.9	78.4	79.3	79.2	79.7	80.8	80.8	79.9	77.9	75.9	78.2
Mean minimum	10	63.7	62.8	63.0	64.9	67.3	68.4	68.4	68.9	68.4	67.8	66.4	64.9	66.2
Mean	10	69.4	68.8	69.4	71.6	73.3	73.8	74.0	74.8	74.6	73.8	72.2	70.4	72.2
Highest	10	80	80	83	85	87	85	84	86	86	85	85	81	87
Lowest	10	56	56	56	58	60	60	58	57	63	59	60	58	56
Relative humidity														
Mean, reduced to 24 hours[a]	10	81	80	80	80	83	81	82	82	83	84	84	82	82
Cloudiness														
Mean, 5 observations	10	5.2	5.2	5.2	5.2	6.1	6.1	6.1	5.7	5.8	5.5	5.4	5.2	5.6
Precipitation														
Mean	10	9.49	6.73	7.48	7.99	15.39	14.17	20.20	16.73	17.09	14.61	16.50	9.84	156.22
Days with rain	10	24	20	21	20	27	26	29	28	24	25	23	23	290
Days with thunderstorm	5	(b)	0	0	(b)	2	3	6	6	7	6	3	(b)	34
Wind														
Prevailing direction	3	ne.	ne.	ne.	ne.	ne.	ne.	e.	ne.	ne.	e.	ne.	e.	ne.
Days with gales	12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.1	0.0	0.4
Days with fog	12	0.2	0.1	0.0	0.1	0.2	0.1	0.1	0.8	0.2	0.2	0.1	0.0	2.1

[a] These means are approximately the same as those obtained as the mean of readings at 9 a. m. and 9 p. m.
[b] Five-year totals for January and April and 6-year total for December are 1, 1, and 3, respectively.

TABLE 44.—*Mean precipitation (in inches), Guadeloupe*

Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Basse Terre														
Basse Terre [a]	34	5.98	3.82	2.96	3.87	5.49	6.56	7.46	8.49	7.66	7.98	6.51	6.41	73.19
Bologne	7	2.24	2.17	2.63	1.67	2.72	6.09	5.39	6.86	6.83	4.88	5.03	2.55	49.06
Camp Jacob [b]	11	10.31	6.84	6.77	5.87	10.65	14.71	14.63	15.80	13.80	15.67	13.79	11.98	140.82
Camp Jacob [c]	10	9.49	6.73	7.48	7.99	15.39	14.17	20.20	16.73	17.09	14.61	16.50	9.84	156.22
Clugny	6													80.67
Josephine	6	8.39	8.84	7.36	6.25	8.18	10.80	14.88	13.91	12.76	10.84	11.35	7.31	120.87
Grand Terre														
Blanchet	14	5.35	2.70	3.10	3.77	4.36	5.06	5.43	6.78	6.29	6.62	6.47	4.56	60.54
Celcour	19	4.07	2.56	2.96	3.03	4.22	4.62	5.43	6.37	6.27	6.42	6.20	4.57	56.72
Gentilly	6													145.37
Point a Pitre [d]	16	3.79	3.09	2.43	2.54	6.51	5.98	5.70	5.70	6.19	7.40	6.92	4.93	61.27
Point a Pitre [e]	19	5.20	3.27	3.99	3.82	6.97	9.37	10.28	10.39	10.24	10.08	9.84	8.35	91.80
Marie Galante														
Grand Bourg	23	3.04	2.16	1.75	3.24	4.90	5.63	5.71	6.68	7.31	5.95	6.67	4.58	57.62

[a] Broken series, 1827–1870. Monthly record given by Raulin in *Actes de L'Académie nationale des sciences, belles-lettres et arts de Bordeaux, Volume 36. 1874.*
[b] Broken series, 1855–1870. (Raulin.)
[c] 1891–1900. *Annales du Bureau Central Météorologique de France, Memoires. 1901.*
[d] Broken series, 1849–1870. (Raulin.)
[e] Later series. Climatological Data: West Indies and Caribbean Service, July, 1925.



DOMINICA

The Weather Bureau records for the period 1917–1924 have been taken in determining temperature means at Roseau. The Quarterly Journal of the Royal Meteorological Society (London) for October, 1897, and January, 1903, gives valuable information on precipitation for several stations well distributed over the island. These two papers contain practically all of the rainfall data available.

The table for Roseau (15° 17′ N., 61° 23′ W., elevation 25 feet) shows mean annual temperature (80°) somewhat higher than that found for the preceding groups and also temperature maxima above 90° in all months of the year. Relative humidity and cloudiness have the normal march for this region. The prevailing winds are from northeast or east; the mean hourly velocity is about 5 miles per hour, with a very slight increase in March and April.

The rainfall normals for the stations in Dominica furnish a most interesting example of the effect of exposure. On the leeward coast the mean annual precipitation ranges from about 70 inches in the "drier," middle region to 100 inches at Soufriere, near the southern extremity of the island. At Woodford Hill, on the northeastern, and Geneva, on the southern coast, the amounts are 103 and 123 inches, respectively. The outstanding feature of distribution is the remarkable increase in annual precipitation from 78 inches at Roseau to 105 inches at St. Aroment (elevation 360 feet), about 2 miles to the northeast, and to 185 inches at Shawford (elevation 560 feet), only 1 mile farther in the same direction.

The annual march presents the chief maximum in July or August and a secondary with nearly the same values in November; the chief minimum occurs in March or April.

TABLE 45.—*Roseau, Dominica*

	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	6	85.8	85.3	85.7	87.1	88.4	88.9	88.4	89.6	90.7	90.3	90.1	86.8	88.1
Mean minimum	6	69.4	69.2	69.5	70.4	72.6	73.8	73.9	73.6	73.7	72.9	72.2	70.4	71.8
Mean	6	77.6	77.2	77.6	78.8	80.5	81.4	81.2	81.6	82.2	81.6	81.2	78.6	80.0
Highest	6	91	91	94	93	93	93	93	96	96	97	96	93	97
Lowest	6	64	63	65	67	69	66	68	71	68	68	69	66	63
Relative humidity														
Mean, 8 a., 8 p.[a]	3	72	68	67	66	68	73	73	74	75	74	75	72	72
Cloudiness														
Mean, 2 observations [a]	3	4.7	3.8	4.1	4.0	4.8	6.5	5.6	5.2	5.4	5.0	4.9	4.5	4.9
Precipitation														
Mean [b]	27	4.92	3.43	3.08	2.97	4.44	8.10	10.75	10.04	8.75	7.73	6.97	6.46	77.64
Mean [c]	14	4.59	2.69	2.37	1.67	3.38	5.75	10.47	8.26	6.03	6.39	5.18	5.09	61.87
Days with rain	10	18	14	15	10	15	21	23	22	19	18	16	18	209
Days with thunderstorm [a]	3	0	0	0	0	1	4	3	4	3	2	2	1	20
Wind														
Prevailing direction [a]	3	ne.	ne.	e.	e.	e.	ne.	ne.	ne.	e.	ne.	ne.	ne.	ne.
Mean hourly velocity [a]	3	5.1	5.6	6.5	6.1	5.4	5.0	5.1	5.3	5.2	5.0	4.9	5.2	5.4
Days with fog	4	0	0	0	0	0	0	0	0	0	0	0	0	0

[a] For the period 1899–1901.
[b] From Climatological Data, West Indies and Caribbean Service, July, 1925.
[c] For the period 1893–1924 (broken).

TABLE 46.—*Mean precipitation (in inches), Dominica*

Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Batalie	5	2.08	1.75	2.40	1.09	7.80	8.20	9.43	7.38	8.35	7.21	8.31	5.92	69.92
Geneva	14													122.64
Roseau	27	4.92	3.43	3.08	2.97	4.44	8.10	10.75	10.04	8.75	7.73	6.97	6.46	77.64
St. Aroment	20	8.74	4.58	4.13	3.80	6.03	12.17	14.40	12.24	10.90	9.90	10.79	7.35	105.03
Shawford [a]	5	11.74	9.09	11.14	9.65	19.22	16.21	23.08	20.51	18.12	14.35	22.79	17.38	193.28
Soufriere	11													100.90
Woodford Hill	16	7.58	4.40	3.08	6.19	9.40	10.14	9.63	9.86	9.80	11.53	10.98	9.36	103.44

[a] Annual mean for the period 1875–1897, 184.57 inches.

MARTINIQUE

The *Annales* published by the French Meteorological Service contain rather long series of observations at Fort de France near the middle of the western coast (14° 36′ N., 61° 2′ W., elevation 13 feet) and the elevated station of Morne des Cadets (14° 44′ N., 61° 9′ W., elevation 1,676 feet).

The mean annual temperatures for these stations are 79° and 74°, respectively. Monthly mean temperatures range from 80° in June–October to 76° in January–February at the former and from 76° in August–October to 71° in January–February at the latter. Observed temperature extremes are about the same for both locations—90° or slightly higher and about 60°.

In the Climatological Report for the West Ind es are found precipitation data for the years 1921–1923. A series so short will not be of much value in determining normals, but will probably be of some interest relative to

rainfall distribution over the island. Means from this source are given for Bassepoint (north), Robert (middle east coast), and Marin (south). The means for Fort de France for the same period present marked contrast with those for 24 years—56 inches in 1921–1923 and 80 inches in 1891–1914.

TABLE 47.—*Fort de France, Martinique*

	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	15	83.5	83.8	84.9	86.4	86.7	86.2	86.2	87.1	87.6	87.3	86.4	84.4	85.9
Mean minimum	15	68.9	68.7	69.3	71.2	73.0	73.9	73.9	73.9	73.6	73.0	72.3	70.5	71.8
Mean	15	76.2	76.2	77.1	78.8	79.8	80.0	80.0	80.5	80.6	80.2	79.4	77.4	78.8
Highest	10	88	91	91	91	91	91	90	91	93	92	92	89	93
Lowest	10	59	60	61	63	68	68	69	69	68	65	66	62	59
Relative humidity														
Mean, 6 a., 10 a., 4 p.	14	80	78	76	76	78	80	81	81	82	83	83	82	80
Cloudiness														
Mean, 3 observations	10	6.0	6.2	6.0	6.5	6.8	7.0	6.9	6.4	6.4	6.3	5.8	5.5	6.3
Precipitation														
Mean	31	4.68	4.25	2.91	3.90	4.68	7.44	9.37	10.31	9.25	9.64	7.87	5.91	80.21
Days with rain	15	19	14	16	14	16	21	22	22	20	19	20	19	222
Wind														
Prevailing direction, 3 observations	15	ne.	ne.	e.	e.	e.	e.	e.	e.	ne.	n.	n.	n.	e.
Days with gales	20	0	0	(a)	0	0	0	0	0	0	(a)	0	0	0.1
Days with fog	20	0.5	0.7	0.4	0.0	0.1	0.0	0.0	0.1	0.1	0.5	0.1	0.1	2.6

[a] Totals for 20-year period are: March, 1; October, 1.

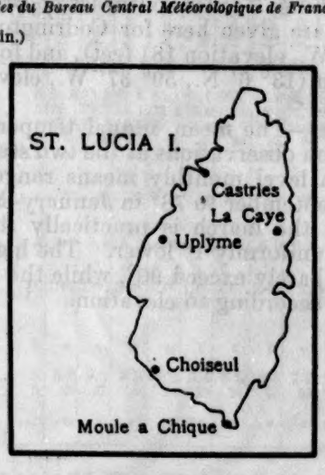
TABLE 48.—*Morne des Cadets, Martinique*

	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	9	77.9	78.1	79.7	80.6	82.0	81.1	81.5	82.8	83.7	83.1	81.7	79.2	81.0
Mean minimum	9	64.4	64.0	64.4	65.7	67.6	68.4	68.5	69.1	69.3	69.1	68.2	66.4	67.1
Mean	9	71.2	71.0	72.0	73.2	74.8	74.8	75.0	76.0	76.5	76.1	75.0	72.8	74.0
Highest	9	86	84	88	88	88	88	87	88	90	88	88	87	90
Lowest	9	59	60	61	62	64	64	65	66	65	64	65	63	59
Relative humidity														
Mean, 6 a., 10 a., 4 p.	9	77	76	74	75	75	77	77	77	77	77	78	78	76
Cloudiness														
Mean, 3 observations	9	5.7	5.7	5.7	6.1	6.1	6.8	5.8	5.9	5.7	6.0	5.7	5.9	a.9
Precipitation														
Mean	9	9.68	6.49	6.79	6.93	6.29	11.59	13.48	15.24	11.11	9.95	10.57	12.07	120.19
Days with rain	9	25	22	24	21	21	26	27	27	22	24	24	25	288
Wind														
Prevailing direction, 3 observations	9	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.

TABLE 49.—*Mean precipitation (in inches), Martinique*

Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Bassepoint	3	2.93	1.43	3.58	3.15	2.45	3.01	8.25	6.69	11.87	7.10	6.51	9.36	66.33
Fort de France [a]	31	4.68	4.25	2.91	3.90	4.68	7.44	9.37	10.31	9.25	9.64	7.87	5.91	80.21
Fort de France [b]	24	4.54	2.83	3.51	2.94	6.94	7.51	8.89	9.54	9.66	8.16	8.78	6.61	79.91
Fort de France [c]	3	2.16	2.35	2.69	2.31	1.92	3.21	7.59	7.11	10.17	5.56	5.61	5.48	56.16
Marin	3	1.48	1.73	2.56	2.30	0.91	0.81	7.17	3.73	7.86	4.53	4.70	7.65	45.43
Morne des Cadets	9	9.68	6.49	6.79	6.93	6.29	11.59	13.48	15.24	11.11	9.95	10.57	12.07	120.19
Robert	3	1.46	2.24	1.78	2.20	1.48	3.01	5.69	4.92	8.95	5.04	5.55	8.98	51.30
St. Pierre [d]	41	5.01	4.14	4.16	3.85	6.60	9.74	12.11	13.73	10.57	9.15	8.96	7.62	95.64

[a] Broken series. 1834–1870. Monthly record given by Raulin in *Actes de L'Académie national des sciences, belles-lettres et arts de Bordeaux volume 36. 1874.*
[b] 1891–1914. *Annales du Bureau Central Météorologique de France.*
[c] 1921–1923.
[d] 1830–1870. (Raulin.)



ST. LUCIA

Temperatures on this island are given by the records of two stations at Castries. Observations are available for the botanical station (14° 1′ N., 61° 0′ W., elevation 10 feet) and for the Weather Bureau stations near by (elevations 319 and 50 feet). On account of the considerable difference in elevation, data are given for the lowest and highest levels.

Again we find the characteristic difference in amount of precipitation due to the rugged outlines common to so many of the West Indian Islands. From a rather large number of stations five have been chosen to represent conditions in the different parts of the island.

The mean annual precipitation ranges from 50 inches at Moule a Chique to 130 inches at Uplyme. Following the relatively dry season from February to April, there is a gradual increase in rainfall to a maximum from July to October.

TABLE 50.—*Castries (Botanical Station), St. Lucia*

	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	7	82.3	82.6	84.2	85.3	86.5	86.5	86.8	87.4	87.9	86.5	85.1	83.1	85.4
Mean minimum	7	69.0	69.0	69.7	70.9	73.1	74.2	74.1	73.9	73.3	72.6	72.0	70.9	71.9
Mean	7	75.6	75.8	77.0	78.1	79.8	80.4	80.4	80.6	80.6	79.6	78.6	77.0	78.6
Highest	7	86	87	90	90	91	92	90	92	92	92	90	89	92
Lowest	7	62	60	62	62	66	67	69	68	68	68	67	63	60
Relative humidity														
Mean, 7 a., 3 p.	5	79	76	77	77	78	80	78	80	82	81	83	82	79
Precipitation														
Mean	34	5.68	3.89	4.12	4.01	6.88	8.98	9.73	10.45	9.73	10.28	9.29	7.96	91.00
Maximum in 24 hours	11	3.16	4.23	1.91	3.85	4.03	3.90	2.52	6.92	*13.18	2.86	4.01	4.60	*13.18
Days with rain	11	22	18	19	17	19	25	26	25	22	23	22	23	261

*Gage overflowed.

TABLE 51.—*Castries (U. S. Weather Bureau), St. Lucia*

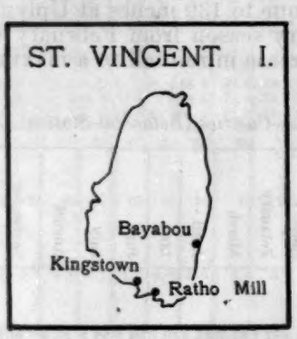
	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	4	81.3	82.2	82.3	84.9	85.4	85.3	85.2	86.0	86.9	86.7	85.9	83.1	84.6
Mean minimum	4	70.5	70.4	70.0	71.0	73.0	74.0	73.7	73.9	73.8	73.4	72.9	71.2	72.3
Mean	4	75.9	76.3	76.2	78.0	79.2	79.6	79.4	80.0	80.4	80.0	79.4	77.2	78.5
Highest	4	87	86	87	90	93	90	90	92	92	91	91	89	93
Lowest	4	66	67	66	68	69	70	68	70	68	68	68	67	66
Precipitation														
Mean	6	5.83	4.62	5.20	3.74	5.30	6.68	9.86	9.73	9.13	8.21	7.29	8.37	83.96
Maximum in 24 hours	6	1.91	1.98	1.78	3.75	2.34	1.61	4.76	2.41	2.98	5.23	1.65	4.97	4.97
Days with rain	6	22	20	22	18	19	26	26	25	24	23	20	22	267
Wind														
Prevailing direction	4	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.

TABLE 52.—*Mean precipitation (in inches), St. Lucia*

Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Castries (B. S.)	34	5.68	3.89	4.12	4.01	6.88	8.98	9.73	10.45	9.73	10.28	9.29	7.96	91.00
Castries (W. B.)	6	5.83	4.62	5.20	3.74	5.30	6.68	9.86	9.73	9.13	8.21	7.29	8.37	83.96
Choiseul	7	3.45	2.01	2.98	2.05	3.17	5.79	8.17	8.08	7.78	9.05	7.48	4.03	64.04
La Caye	10	4.18	3.72	3.26	4.11	4.04	6.77	6.99	7.23	8.49	9.92	7.54	6.43	72.68
Moule a Chique	10	2.85	1.55	2.01	2.30	2.26	4.21	4.86	6.18	5.64	6.58	6.16	4.18	48.78
Uplyme	10	7.69	7.30	6.68	6.30	8.61	11.75	15.00	13.66	13.23	14.85	13.68	11.20	129.95

ST. VINCENT

The series of observations at the experiment station near Kingstown (13° 9′ N., 61° 14′ W., elevation 80 feet) for the period 1909–1921 is the only source of information relative to meteorological conditions prevailing on the island in recent years. Precipitation means based on early records are available for Kingstown; Ratho Mill, near the southern extremity of the island; and Bayabou, on the eastern coast.



In this latitude we find that the difference in mean temperatures of the warmest and coldest months is very small; the extremes of monthly means are 81° in September and 77° in January and March. In a period of nine years maximum readings of 90° or above were observed only in the months of September and October; minima of about 65° occurred in January and February.

The mean annual precipitation is 70 to 90 inches in the southern part of the island; no data are available for other regions. The precipitation from June to November is much heavier than that during the remainder of the year.

TABLE 53.—*Kingstown (Experiment Station), St. Vincent*

	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	3	82.4	81.8	82.1	83.1	83.8	83.8	84.4	85.1	85.8	85.1	84.5	83.1	83.8
Mean minimum	3	71.6	72.8	72.0	73.9	74.7	75.6	75.8	76.5	76.2	75.1	73.8	72.4	74.2
Mean	3	77.0	77.3	77.0	78.5	79.2	79.7	80.1	80.8	81.0	80.1	79.2	77.8	79.0
Highest	9	86	85	89	88	87	87	89	88	90	91	87	87	91
Lowest	9	65	64	66	68	71	71	71	72	71	72	69	67	64
Relative humidity														
Mean, 9 a., 3 p.	5	68	70	66	66	69	72	73	72	72	72	73	70	70
Precipitation														
Mean	11	5.42	4.00	3.59	4.08	4.52	8.68	9.42	10.68	10.06	11.97	12.60	5.78	90.80
Maximum in 24 hours	9	2.03	3.34	1.38	2.29	2.28	3.02	2.07	3.61	4.42	5.17	6.88	1.67	6.88
Days with rain	9	22	20	19	16	19	25	26	26	23	25	24	22	267

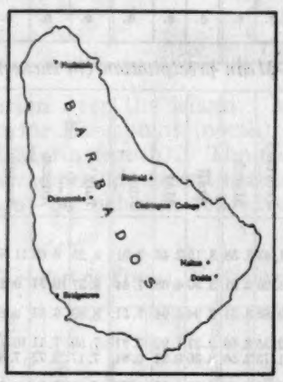
TABLE 54.—*Mean precipitation (in inches), St. Vincent*

Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Bayabou *	6	2.36	2.00	2.84	1.70	6.36	7.61	7.39	6.75	10.08	9.12	8.90	4.45	69.56
Kingstown (1913–1923)	11	5.42	4.00	3.59	4.08	4.52	8.68	9.42	10.68	10.06	11.97	12.60	5.78	90.80
Kingstown (old records) *	23	5.08	2.68	2.95	2.91	5.98	9.09	9.09	8.07	8.50	8.86	9.69	5.75	78.65
Ratho Mill *	13	5.71	2.17	3.03	2.80	5.87	8.46	8.50	6.77	10.79	9.25	11.38	6.81	81.54

* *Die Verteilung des Niederschlags auf der festen Erdoberfläche*, Supa.

BARBADOS

Early records for stations in the vicinity of Bridgetown for the periods 1853–1862 and 1865–1886 appear in Meteorological Observations at Foreign and Colonial Stations of the Royal Engineers and the Army Medical Department, No. 83, London Meteorological Office. In a report on the rainfall of Barbados in 1847–1871 Rawson gives records for three stations in the eastern half of the island. The series of observations at Dodd's Station, in the southeast, began in 1891(?) and that for the present Government Meteorological Station at Codrington House,



near Bridgetown, in July, 1902. The records of the U. S. Weather Bureau cover the periods September, 1898–October, 1903 (Bridgetown) and from September, 1917, to date (Worthing, 3 miles southeast of Bridgetown).

Summaries are given here for Codrington House (13° 8′ N., 59° 36′ W., elevation 181 feet), and for the Weather Bureau station (13° 6′ N., 59° 37′ W., elevation 30 feet) in Bridgetown.

Temperature.—The mean annual temperature for this region, based on observations at the two stations, is about 79°; near sea level monthly means range from 81° in August and September to 78° in January–March; at the 180-foot level the march is practically the same, with values rather uniformly 1° lower. The highest observed temperatures barely exceed 90°, while the lowest are 65° to about 60°, according to elevation.

Precipitation.—The records for the period 1891–1908 furnish the best series to represent comparative amounts of rainfall received in different sections of the island. The mean annual amounts are as follows: Fifty-five inches on the southwestern coast (Bridgetown), 60 inches in the north (Husbands), on the eastern coast (Codrington College), and in the southern interior (Dodds), and 86 inches in the central elevated region (Dunscombe). In the march of precipitation all stations show the minimum in February, a continuous increase to the maximum in September, and generally a secondary maximum in November.

Owing to many changes in the location of the point of observation in or near Bridgetown, precipitation means for the different series are not combined. Footnotes under table of precipitation means will furnish information for comparison of conditions in earlier and later years.

TABLE 55.—*Bridgetown (Codrington House), Barbados*

	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	10	82.9	83.3	84.0	85.4	86.7	86.4	86.1	86.2	86.0	85.5	84.6	83.4	85.0
Mean minimum	10	69.7	69.7	70.0	71.5	73.3	74.2	73.8	73.9	73.7	73.1	72.7	71.1	72.2
Mean	10	76.3	76.5	77.0	78.4	80.0	80.3	80.0	80.0	79.8	79.3	78.6	77.2	78.6
Highest	18	86	87	88	90	90	89	89	91	90	89	88	87	91
Lowest	18	61	61	62	64	66	66	68	68	67	68	67	64	61
Relative humidity														
Mean, 9 a., 3 p	10	65	63	60	60	61	65	66	67	70	70	71	68	66
Cloudiness														
Mean, 2 observations	8	7.1	7.0	7.0	7.3	7.4	7.6	7.4	7.2	7.4	7.5	7.3	7.1	7.3
Precipitation														
Mean	19	2.06	1.70	1.64	1.67	1.82	4.36	4.84	6.81	6.60	6.03	4.58	3.47	45.58
Maximum in 24 hours	7	1.38	0.89	1.64	2.56	1.14	1.99	3.17	3.76	4.65	4.45	2.36	2.49	4.65
Days with rain	19	13	12	11	8	10	16	18	17	16	17	15	15	168
Wind														
Prevailing direction	8	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.
Mean hourly velocity	8	12.5	13.5	12.4	12.4	12.8	13.5	12.4	9.8	8.1	7.5	8.4	10.6	11.2
Days with gales	23	0	0	0	0	0	0	0	0	(*)	0	0	0	0
Days with fog	23	0	0	0	0	0	0	0	0	0	0	0	0	0

* Total number for the period of 23 years; September, 1.

TABLE 56.—*Bridgetown (U. S. Weather Bureau), Barbados*

	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	5	83.6	83.5	83.8	85.1	85.9	86.0	86.0	86.7	86.7	86.3	85.8	84.6	85.3
Mean minimum	5	72.1	71.7	72.1	73.2	75.0	75.3	75.2	75.2	75.1	74.5	74.7	73.0	73.9
Mean	5	77.8	77.6	78.0	79.2	80.4	80.6	80.6	81.0	80.9	80.4	80.2	78.8	79.6
Highest	5	86	86	87	88	88	89	88	90	90	90	88	87	90
Lowest	5	68	67	67	68	69	71	70	70	69	65	68	68	65
Relative humidity														
Mean, 8 a., 8 p	5	77	75	74	73	75	78	80	80	79	80	79	78	77
Cloudiness														
Mean	5	5.0	5.3	5.4	5.5	5.8	6.7	6.0	6.0	6.0	6.1	6.0	5.6	5.8
Precipitation														
Mean *	11	1.69	1.30	1.28	1.07	1.90	3.67	5.04	6.82	6.85	5.30	4.20	2.99	42.11
Days with rain *	11	16	12	11	9	11	16	19	18	14	16	14	15	171
Wind														
Prevailing direction	5	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.	e.
Mean hourly velocity	5	8.6	9.3	8.9	9.0	9.5	9.6	8.5	7.7	7.1	6.7	7.7	7.6	8.4
Maximum velocity	5	28	27	25	24	28	28	36	52	*62	33	28	25	62
Direction at maximum	----	e.	e.	e.	se.	se.	se.	e.	s.	ne.	sw.	se.	e.	ne.

* Sept. 10, 1898.
* Record for Worthing for 1917–1924 combined with that for Bridgetown.

TABLE 57.—*Mean precipitation (in inches), Barbados*

Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Binfield	18	3.74	3.20	1.76	2.51	3.71	6.34	6.58	7.97	7.88	9.47	8.03	5.24	66.43
Bridgetown I	31	2.70	1.75	1.25	1.23	3.03	4.86	5.05	6.44	6.90	7.60	6.22	3.09	50.12
Bridgetown II	17	2.87	1.54	1.98	2.01	2.76	5.26	5.69	7.42	7.98	6.30	6.81	4.33	54.95
Bridgetown III	19	2.06	1.70	1.64	1.67	1.82	4.36	4.84	6.81	6.60	6.03	4.58	3.47	45.58
Bridgetown IV	11	1.69	1.30	1.28	1.07	1.90	3.67	5.04	6.82	6.85	5.30	4.20	2.99	42.11
Codrington College	16	3.34	1.59	2.51	3.10	3.42	6.03	6.71	7.28	8.04	6.08	7.85	5.22	61.17
Dodds	17	3.13	1.67	2.50	2.80	2.87	5.75	6.05	7.25	7.74	6.53	6.65	5.75	58.69
Dunscombe	17	5.01	2.96	4.17	3.59	4.71	8.85	9.30	9.86	11.52	8.91	9.69	7.35	85.92
Halton	18	2.96	2.40	1.48	2.07	3.23	5.17	5.14	7.15	5.99	8.65	6.72	4.62	55.58
Husbands I	18	2.63	2.27	1.07	1.82	3.23	5.14	5.73	7.48	6.68	8.89	7.33	4.08	56.35
Husbands II	13	3.04	1.57	1.92	2.76	3.63	5.27	7.16	7.02	8.29	6.54	5.75	5.23	58.18

NOTE.—Binfield, central interior, 1,064 feet, 1854–1871; Bridgetown I., different elevations, 1853–1862 and 1865–1886; Bridgetown II. (Central Police Station and Government House), 1890–1908; Bridgetown III. (Codrington House), 181 feet, 1903–1923; Bridgetown IV. (U. S. Weather Bureau), 30 feet, 1898–1903 and 1917–1924; Codrington College, east coast, 1891–1908; Dodds, southeastern interior, 210 feet, 1891–1908; Dunscombe central interior, 850 feet, 1891–1908; Halton, near Dodds; 280 feet, 1854–1871; Husbands I, northern region, 184 feet, 1854–1871; Husbands II., 1895–1908.

GRENADA

Meteorological conditions at moderate elevation are given in the table for Richmond Hill, near St. George, on the southern leeward coast (12° 31′ N., 61° 45′ W elevation 509 feet).

In the southern part of this island we find another instance of marked change in amount of rainfall received at points within a very small area. At Point Saline, the southwestern extremity, the mean annual precipitation is only 39 inches; at Richmond Hill, a few miles to the north, it is 77 inches, while at Grand Etang (elevation, 1,740 feet), near the center of the island, it increases to 147 inches. At Sauteurs, on the northern coast, and Dunfermline, just inland from the eastern coast, the means of annual rainfall are 60 and 70 inches, respectively. In the relatively dry months of February and March the mean monthly rainfall in the extreme south is about 1 inch; in the period of maximum fall, July and August, monthly totals for the island range from 6 to 15 inches.

TABLE 58.—*St. George (Richmond Hill), Grenada*

	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	12	82.1	82.4	82.8	84.3	84.7	83.9	84.0	85.0	85.5	85.2	84.0	83.2	83.9
Mean minimum	12	72.1	72.0	72.2	73.7	74.6	74.5	75.0	74.4	75.2	75.2	74.4	73.3	73.9
Mean	12	77.1	77.2	77.5	79.0	79.6	79.2	79.5	79.7	80.4	80.2	79.2	78.2	78.9
Highest	12	88	89	90	89	90	89	90	91	93	92	90	88	93
Lowest	12	69	68	68	69	69	70	70	69	70	70	70	68	68
Relative humidity														
Mean, 9 a., 6 p	12	75	73	71	72	74	77	77	77	77	79	78	76	76
Cloudiness														
Mean 2 observations	12	3.4	3.2	3.2	3.8	4.5	5.2	4.4	4.5	3.9	4.1	4.1	3.7	4.0
Precipitation														
Mean	30	4.45	2.83	2.82	2.24	4.58	8.35	9.80	9.70	8.26	7.77	8.42	7.44	76.56
Maximum in 24 hours	12	1.82	1.40	1.22	1.30	3.50	2.90	3.70	3.45	3.90	4.35	4.30	2.90	4.35
Days with rain	12	18	13	13	11	14	21	22	21	18	17	20	18	206
Days with thunderstorm	12	(*)	(*)	0	(*)	(*)	1	1	3	3	2	1	(*)	12
Days with gales	28	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.3
Days with fog	28	0	0	0	0	0	0	0	0	0	0	0	0	0

* Totals for 12-year period; January, 1; February, 1; April, 2; May, 1; December, 2.

TABLE 59.—*Mean precipitation (in inches), Grenada*

Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Dunfermline	7	3.67	2.26	2.13	3.38	3.70	..01	9.00	8.94	7.64	7.92	8.90	5.22	69.83
Grand Etang	10	8.35	6.49	7.77	7.21	10.12	14.10	15.93	15.34	15.23	15.50	16.89	13.97	146.90
Point Saline	10	1.67	0.82	1.10	0.39	1.44	4.57	5.71	6.35	4.66	4.30	4.86	3.12	38.99
Richmond Hill	30	4.45	2.83	2.82	2.24	4.58	8.35	9.80	9.70	8.26	7.77	8.42	7.44	76.56
Sauteurs	11	3.06	2.43	2.46	*1.38	3.19	5.98	8.29	7.64	6.51	6.64	8.02	4.87	60.47
Top Hill, Carriacou Is	10	2.31	1.80	1.71	1.71	2.97	5.01	6.71	6.69	5.10	5.69	5.91	3.85	49.46

* 24.17 inches in April, 1915, not included.

TOBAGO

The short, broken series of temperature records for Pembroke and The Park (1891–1893) found in the meteorological returns for Trinidad are not summarized. The means of precipitation show a considerable range in the amount of rain received in different sections of the island.

TABLE 60.—*Mean precipitation (in inches), Tobago*

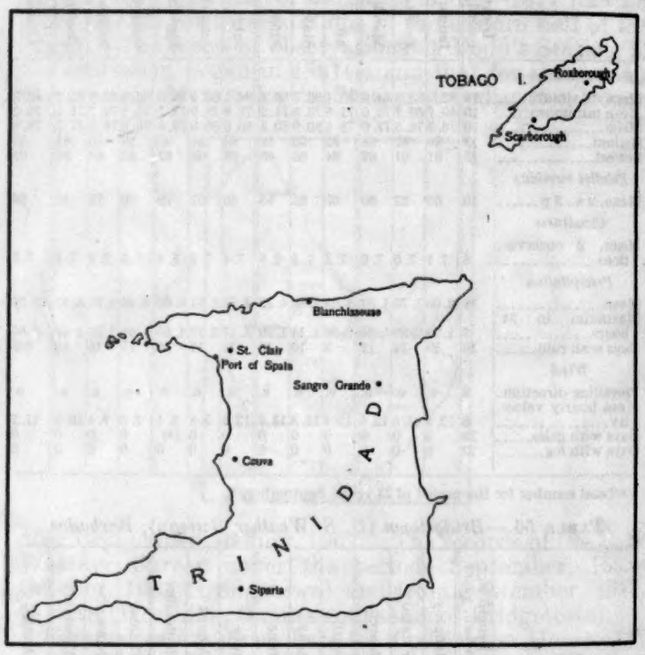
Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Botanic Station	23	3.20	1.83	1.95	1.97	5.00	8.79	9.20	9.03	8.21	8.43	7.58	6.43	71.62
Government Farm *	13	1.69	1.19	0.90	1.09	2.62	5.68	6.19	5.94	5.46	6.22	6.11	3.85	46.04
Roxborough Estate *	12	5.81	3.92	3.71	3.01	5.40	9.75	10.52	9.37	10.32	11.19	9.42	8.68	91.10

* Near Scarborough.

TRINIDAD

Climatic tables are given for three closely adjacent stations in or near Port of Spain, in the northwestern part of the island: Botanical Gardens, St. Clair Experiment Station, and the Weather Bureau station. (See footnotes to tables for geographic coordinates and elevations.)

Temperature.—The mean annual temperature rises from 78° at St. Clair to 79° at the botanical gardens and to 80° in the city of Port of Spain. In contrast to the annual march in temperature noted for the regions previously considered we find here two maxima—one in May and another in September or October; the secondary minimum in July or August is very slightly marked, but appears in the values at all stations. The difference between the highest and lowest monthly mean temperatures is only 3°. St. Clair shows an extreme temperature range of 45° (101° and 56°), which is considerably greater than that found at any other station in the southern part of the West Indian region.



Precipitation.—In the vicinity of Port of Spain the mean annual precipitation is about 60 inches and the same amount is received along the middle of the western coast; at Siparia, near the southern coast, and at Blanchisseuse, on the northern coast, there is an increase to about 85 inches, and at Sangre Grande, a few miles from the mid-eastern coast, a further increase to 112 inches. The rainfall is least in February, when the mean amount falls to 1.50 inches or less in the drier regions, and it is greatest in July or August, when the means range from about 8 inches at Port of Spain to 13 inches at Sangre Grande.

In the MONTHLY WEATHER REVIEW for February, 1925, P. E. James contributes an interesting paper on the climate of Trinidad.

TABLE 61.—*Port of Spain* (Botanical Gardens), Trinidad*

	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	9	86.1	86.4	87.2	88.7	90.6	88.3	88.0	88.6	88.8	89.0	87.4	86.8	88.0
Mean minimum	9	67.5	67.1	67.8	68.3	70.6	70.5	70.6	71.0	71.1	70.8	70.6	69.4	69.6
Mean	9	76.5	76.8	77.5	78.5	80.6	79.4	79.3	79.8	80.0	79.9	79.0	78.1	78.8
Highest	9	92	95	95	94	95	97	97	93	93	93	92	91	97
Lowest	9	61	62	60	62	63	66	63	65	67	66	63	60	60
Relative humidity														
Mean, 7 a., 3 p	9	80	76	75	74	75	79	81	83	82	82	83	81	79
Precipitation														
Mean	9	3.11	1.59	1.79	2.32	4.38	8.42	8.71	9.03	6.61	7.22	8.75	4.93	66.86
Maximum in 24 hours	9	4.00	1.72	1.18	1.86	2.44	3.75	2.51	3.17	2.80	5.90	3.10	2.53	5.90
Days with rain	9	14	11	10	9	12	19	21	22	15	15	19	15	182

* 10° 40′ N., 61° 26′ W.: elevation, 130 feet.

TABLE 62.—*Port of Spain* (St. Clair), Trinidad*

	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	20	84.7	85.6	86.2	88.0	88.2	85.7	86.2	85.4	86.3	86.7	86.1	85.3	86.2
Mean minimum	20	66.9	67.0	66.6	68.2	69.9	70.2	69.8	70.3	69.9	70.5	70.3	68.9	69.0
Mean	20	75.8	76.3	76.4	78.1	79.0	78.0	78.0	77.8	78.1	78.6	78.2	77.1	77.6
Highest	20	92	93	99	99	98	96	97	97	101	93	95	97	101
Lowest	20	57	60	60	60	57	60	61	61	56	61	61	61	56
Relative humidity														
Mean, 7 a., 3 p	14	81	78	80	76	76	80	82	84	82	83	81	83	80
Sunshine														
Mean daily duration, hours	8	6.6	7.7	7.0	6.7	6.6	6.1	5.9	5.8	5.5	6.1	6.7	6.7	6.4
Precipitation														
Mean	21	2.29	1.25	1.77	1.35	3.11	7.29	8.41	8.58	7.69	6.33	6.57	4.47	59.11
Maximum in 24 hours	18	1.82	1.48	1.51	2.48	2.33	2.60	2.50	2.66	2.92	3.16	2.21	1.82	3.16
Days with rain	20	10	8	9	6	11	18	20	21	16	16	16	14	165
Wind														
Prevailing direction	10	ne.	ne	ne.	ne.	ne.	ne.	ne.	ne.	ne.	ne.	ne.	ne.	ne.

* 10° 40′ N., 61° 31′ W.; elevation, 67 feet.

TABLE 63.—*Port of Spain (U. S. Weather Bureau),* Trinidad*

	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	8	85.3	85.6	86.1	87.1	87.6	86.8	86.4	87.2	87.8	87.4	86.7	85.7	86.6
Mean minimum	8	70.9	70.8	71.2	72.2	73.4	73.2	73.0	73.1	73.7	73.2	72.9	71.9	72.5
Mean	8	78.1	78.2	78.6	79.6	80.5	80.0	79.7	80.2	80.8	80.3	79.8	78.8	79.6
Highest	11	89	90	90	95	92	92	91	92	93	92	92	90	95
Lowest	11	66	66	66	66	69	69	70	66	68	70	69	67	66
Relative humidity														
Mean, 8 a., 8 p	3	77	74	74	73	74	81	80	82	79	79	80	79	78
Cloudiness														
Mean	3	5.6	5.0	6.5	5.6	5.9	7.0	6.4	6.6	6.3	6.5	6.3	6.2	6.2
Precipitation														
Mean	12	2.26	1.13	1.80	1.19	2.50	6.74	7.88	7.41	6.44	5.62	6.52	4.50	53.99
Maximum in 24 hours	8	2.67	0.71	0.88	2.36	0.92	1.97	2.73	2.10	2.80	2.35	1.82	2.00	2.80
Days with rain	10	13	9	11	6	10	18	21	20	17	16	20	17	178

* 10° 39′ N., 61° 31′ W.; elevation, 40 feet.

TABLE 64.—*Mean precipitation (in inches), Trinidad*

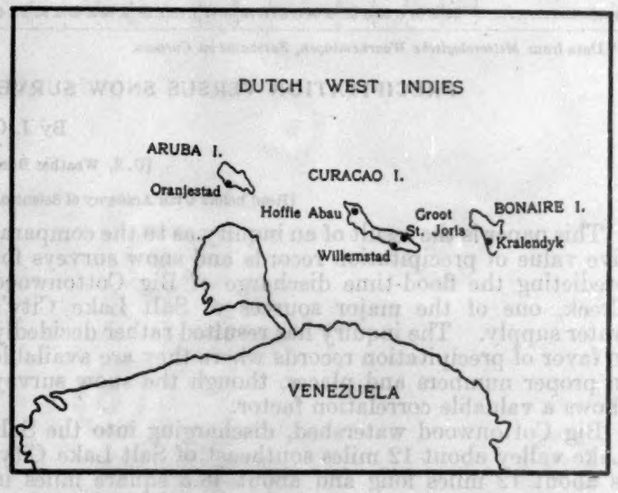
	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Blanchisseuse	29	6.99	4.14	4.22	3.26	5.66	10.55	11.41	9.52	6.21	6.07	8.54	9.09	85.66
Couva	28	2.76	1.35	1.66	1.96	3.92	8.12	8.31	9.21	6.88	6.21	6.42	5.10	61.90
Port of Spain I	26	2.23	1.12	1.38	1.41	3.50	7.44	7.65	8.42	6.07	6.26	6.55	4.38	56.41
Port of Spain II	12	2.26	1.13	1.80	1.19	2.50	6.74	7.88	7.41	6.44	5.62	6.52	4.50	53.99
Sangre Grande	27	7.32	4.08	4.67	4.20	8.43	13.75	13.99	12.55	8.71	9.43	13.26	11.53	111.92
St. Clair I	21	2.29	1.25	1.77	1.35	3.11	7.29	8.41	8.58	7.69	6.33	6.57	4.47	59.11
St. Clair II	60	2.74	1.51	1.87	1.88	3.60	7.97	8.91	9.64	7.41	6.64	7.02	4.68	63.87
Siparia	28	4.32	2.63	3.14	2.88	5.56	10.26	11.80	10.15	6.83	7.54	9.90	8.23	83.24

NOTE.—Port of Spain I, Central Police Station, 1891–1919; Port of Spain II, Weather Bureau, 1898–1900 and 1915–1924; St. Clair I, 1901–1921; St. Clair II, records for two adjacent stations (see text), 1862–1921.

DUTCH WEST INDIES (SOUTHERN GROUP) [1]

Meteorological conditions in this region are represented by the climatic data given for Willemstad, Curacao (12° 6′ N., 68° 56′ W.; elevation, 75 feet).

The mean annual temperature of 81° at Willemstad is the highest known for the entire West Indian region; this is due to the high value of the mean minimum—77° compared with 74° at Bridgetown and 72° at Port of Spain. The maximum in the annual march of temperature occurs in September (83°) and the minimum in the period December–March (79°). The observed temperature extremes are 94° and 67°.



The mean annual rainfall in this region is very light. Hoffie Abau, near the western end of Curacao, receives on an average only 27 inches; in the eastern part of the island there is a decrease to 23 inches at Willemstad, on the southern, and to 21 inches at Groot St. Joris, on the northern coast. The annual mean of 17 inches at Oranjestad, on the island of Aruba, just west of Curacao, is the lowest found in the West Indian region.

From October to January the rainfall in Curacao and vicinity is moderately heavy, generally from nearly 3 to more than 4 inches; during the remainder of the year it is very light, with means for May decreasing to 0.50 inch or less.

[1] Southern islands off the coast of Venezuela. Data for the northern islands, St. Martin, Saba, and St. Eustatius, are given under the heading Northern Leeward Islands.

TABLE 65.—*Willemstad, Curacao**

	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	15	83.1	83.5	83.5	85.1	86.0	86.9	86.7	87.3	87.8	86.9	85.6	83.4	85.5
Mean minimum	15	74.5	74.5	74.5	76.3	77.7	78.1	77.7	77.7	78.3	77.7	76.6	75.2	76.6
Mean	15	78.8	79.0	79.0	80.7	81.8	82.5	82.2	82.5	83.0	82.3	81.1	79.3	81.0
Highest	15	85	87	86	92	90	93	90	91	94	91	90	89	94
Lowest	15	68	68	67	70	73	72	72	71	70	70	70	69	67
Relative humidity														
Mean, 8 a., 2 p., 6 p., (?)	15	77	75	76	76	77	77	78	78	78	78	79	79	77
Cloudiness														
Mean, 3 observations	15	4.7	4.9	4.4	4.9	4.5	4.7	4.4	4.1	4.4	4.8	4.9	4.8	4.6
Precipitation														
Mean	70	2.07	0.95	0.84	1.07	0.76	0.95	1.47	1.22	1.12	4.20	4.43	3.85	22.93

* Data from the *Encyclopaedia van Nederlandsch West Indie.*

TABLE 66.—*Mean precipitation (in inches), Dutch West Indies**

Stations	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Curacao														
Groot St. Joris	17	2.07	1.54	0.85	1.16	0.47	0.63	0.98	0.89	0.95	4.02	4.79	3.05	21.40
Hoffie Abau	13	3.61	2.08	1.13	0.87	0.36	0.85	1.11	1.10	1.76	4.72	5.86	3.37	26.84
Willemstad	70	2.07	0.95	0.84	1.07	0.76	0.95	1.47	1.22	1.12	4.20	4.43	3.85	22.93
Bonaire														
Kralendyk	20	2.28	1.15	0.71	0.65	0.52	0.57	1.13	1.03	1.04	2.10	4.14	3.53	19.95
Aruba														
Oranjestad	24	2.01	0.58	0.66	0.64	0.38	0.53	0.97	1.03	1.28	2.92	3.43	2.98	17.41

* Data from *Meteorologische Waarnemingen, Suriname en Curacao.*

SWAN ISLAND

This small island lies in the western Caribbean Sea about 100 miles off the coast of Honduras (17° 24′ N., 83° 17′ W.; elevation, 35 feet).

The mean annual temperature (80.5°) is 1.5° higher than that for the eastern stations of Christiansted and Basseterre in the same latitude, and is very slightly lower than the high mean noted for Willemstad. The range in temperature is from 92° to 64°, practically the same as observed for the greater part of the West Indian region.

The mean annual rainfall is about the same as that near sea level on the islands of St. Croix, St. Kitts, and Antigua—51 inches.

TABLE 67.—*Swan Island*

	Length of record, years	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Temperature														
Mean maximum	8	82.9	83.4	85.0	86.3	87.6	86.3	87.0	87.8	87.7	86.8	85.0	83.9	85.8
Mean minimum	8	72.8	73.1	73.7	75.3	76.7	76.3	76.7	76.6	76.6	75.8	74.9	73.8	75.2
Mean	8	77.8	78.2	79.4	80.8	82.2	81.3	81.8	82.2	82.2	81.3	80.0	78.8	80.5
Highest	8	88	86	89	90	92	92	91	91	91	90	89	88	92
Lowest	8	64	66	67	68	68	70	70	70	70	70	70	69	64
Precipitation														
Mean	10	3.28	1.35	1.45	0.98	2.12	8.04	4.53	4.27	4.25	7.91	8.73	4.22	51.13
Maximum in 24 hours	10	2.80	1.03	2.54	1.97	3.08	4.90	4.86	3.01	3.32	4.42	5.54	4.10	5.54
Days with rain	10	12	8	6	4	7	16	12	13	13	17	16	15	139

PRECIPITATION VERSUS SNOW SURVEYS FOR PREDICTING STREAM DISCHARGE

By J. CECIL ALTER

[U. S. Weather Bureau, Salt Lake City, Utah]

[Read before Utah Academy of Sciences, Salt Lake City, Utah, Saturday, April 3, 1926]

This paper is the result of an inquiry as to the comparative value of precipitation records and snow surveys for predicting the flood-time discharge of Big Cottonwood Creek, one of the major sources of Salt Lake City's water supply. The inquiry has resulted rather decidedly in favor of precipitation records where they are available in proper numbers and places, though the snow survey shows a valuable correlation factor.

Big Cottonwood watershed, discharging into the Salt Lake valley about 12 miles southeast of Salt Lake City, is about 12 miles long and about 48.5 square miles in extent, its sharp crest lines being from 9,000 to 11,000 feet above the sea. Thus the watershed has appeared to be an excellent region for successful snow survey work. These have been made with encouraging results since 1912 by the Salt Lake City engineering and water works departments.

The results of a preliminary inquiry into the subject of precipitation vs. snow surveys were presented before this Academy a year ago. The surveys, as of the close of April, reduced to percentages of the mean for the period were compared with the stream discharge from May to August, inclusive, a period in which run-off averages about 40,000 acre feet or two-thirds of the annual discharge.

The difference between snow survey percentages (using the densities or water-content values) and stream discharge percentages averaged 13.4 per cent for the period 1912 to 1917 inclusive, utilizing from 60 to 100 measurements distributed fairly generally over the watershed. But for about 25 measurements in Brighton basin, 6.8 square miles in extent, at the head of the canyon, the survey figures differed from the discharges by an average of only 11.5 per cent from 1912 to 1924; while sets of readings in 6 selected places differed 12.5 per cent from the discharge figures; and measurements at only two of these places varied only 12.3 per cent from the discharges. Some of this variation is doubtless due to the differing lengths of the records. It was also shown that the simple snow depth values in Brighton Basin gave an average miss of only 13.3 per cent a somewhat surprising value in view of the general belief that snow densities vary greatly. They probably do not vary greatly at the end of April, by which time the texture of the snow layer has apparently become comparatively homogenous.

The coefficient of correlation for the values of best fit given above (11.5%) was found to be 0.841 plus or minus 0.055, a very good correlation.

A considerable effort has been made by various investigators to discover a relationship between precipitation and stream flow, on the basis of records at the several cooperative weather stations in the general neighborhood of the Cottonwood Canyons. Results have in general been only fair; whence the usual conclusion that the stations are not in correct positions to serve best as indicators, and possibly not numerous enough.

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To overcome some of these defects in the present inquiry the precipitation records have been weighted to accentuate the favorable and to diminish the unfavorable aspects of location; and the investigated group has been enlarged to include several stations not on the watersheds, to correct the defect of dearth of records as far as possible. Furthermore, of the available precipitation records, only selected months were used, rather than the calendar or any other year, having in mind always that the group or unit should serve only as an indicator.

The results shown herein are from precipitation for October to April just preceding the May to August discharge period. The precipatation stations finally used (with their altitudes and average annual precipitation in inches for general information) are as follows: Silver Lake in Brighton Basin, 8,700 feet above sea level, 43 inches annual precipitation; Cottonwood Weir in the mouth of Big Cottonwood Canyon, 4,992 and 22; Lower Mill Creek, about 4 miles south of Cottonwood Weir, 4,959 and 23; Salt Lake City, 4,408 and 16; Midvale 12 miles south of Salt Lake City, 4,365 and 16; Snake Creek, 6 miles southeast of Silver Lake and beyond a high divide, 5,950 and 24; and Heber about 12 miles southeast of Silver Lake, 5,593 and 17. Only Silver Lake and Cottonwood Weir are on the watershed.

Employing precipitation group No. 2 (Silver Lake, 3 times Snake Creek, and 4 times Heber) as a unit for the 10 years of concurrent record, and reducing it to percentages for comparing with the percentages of discharge for the same period, the average deviation was found to be only 6.5 per cent. Precisely the same average deviation was shown by the use of precipitation group No. 5 (Salt Lake City, Silver Lake, 2 times Cottonwood Weir, 5 times Snake Creek, and 6 times Heber) for 8 years of concurrent record.

But testing the relationship by the use of a more trustworthy method, from the original precipitation and stream discharge data, the correlation coefficient for group No. 2, 10 years, was found to be 0.914 plus or minus 0.035; and for group No. 5, 0.979 plus or minus 0.010. The latter is a rather remarkable correlation, due in part probably to chance in so short a record. The original snow survey data for this same 8-year period shows a correlation coefficient of 0.683 plus or minus 0.127, not very satisfactory, though it probably would be improved by a longer record.

Precipitation records as indicators of stream discharge are also very valuable because they apply to other nearby watersheds to a certain extent. For instance, precipitation group No. 2, 10 years, paralleled with the combined original data for the discharge of the two Cottonwood streams, gives a correlation coefficient of 0.921 plus or minus 0.032; while the Brighton Basin snow survey original data gave a correlation coefficient of only 0.608 plus or minus 0.134, when paired with Big and Little Cottonwood Creeks combined.

Similarly, precipitation group No. 5, 8 years, shows a correlation coefficient with the two Cottonwoods combined of plus 0.950 ($\pm$0.023); while the snow-survey correlation coefficient for the same period is only 0.493 plus or minus 0.180. This has practically no predictive value, though it may be due in part to the shortness of record available.

It will not be forgotten that snow measurement sites or stations, like precipitation stations, should be regarded as indicators only; though where their locations are suitable, very good results may be obtained. Furthermore, where there is a scarcity of precipitation records or the tenure of precipitation stations is insecure, the snow survey is, in most watersheds, a convenient and satisfactory substitute.

WHIRLWINDS AT OIL-TANK FIRE, SAN LUIS OBISPO, CALIF.

By J. E. HISSONG

[U. S. Weather Bureau Office, San Luis Obispo, Calif., April 17, 1926

On the morning of April 7, 1926, following a showery night, several mild lightning discharges were noticed in the south, the first at 7:15 a. m., followed by rumbling of thunder in the distance. At 7:35 a. m. a very intense discharge of lightning occurred accompanied by a crash of thunder; this was followed instantly by a terrific explosion that shook the town of San Luis Obispo severely. About 20 large plate-glass windows in store fronts were completely shattered, numerous small windows in residences were broken, houses rocked on their foundations and hundreds of people rushed into the streets, many under the impression that a severe earthquake shock had occurred. The lightning bolt had struck the large oil reservoirs at the tank farm of the Union Oil Co., located about 2½ miles directly south of the center of the town, and the oil, or the vapor in or over three of the reservoirs had exploded, setting them on fire. These reservoirs have a capacity of 750,000 barrels and were full.

An employee of the oil company, who was looking toward the reservoirs at the time of the explosion, said: "I saw two balls of lightning strike reservoirs No. 5 and No. 7; a clap of thunder and an explosion followed immediately and the tanks burst into flames. At the same time the earth rocked so violently under my feet that I was almost thrown down."

A fourth reservoir was fired and exploded about 15 minutes later. Testimony as to the cause of the explosion of this reservoir is conflicting. An inspector for the oil company reported that it was struck by another lightning discharge. Others in the vicinity say that the first explosion threw burning timbers from the roofs of the exploded reservoirs, and possibly burning oil, on the fourth reservoir, causing it to explode.

Approximately 6,000,000 barrels of oil was stored at the farm in concrete reservoirs and steel tanks. With the exception of five of the smaller steel tanks, containing about 250,000 barrels of oil, all the oil burned during the five days of the fire.

Typical thunderstorm conditions prevailed at San Luis Obispo during the morning of the 7th. A storm which had been developing over the ocean between the California coast and the Hawaiian Islands for several days had increased in intensity and moved northeastward during the night. Its center on the morning of the 7th was approximately 600 miles west of San Francisco, the lowest barometer reading near the center being close to 29.00 inches. The thunderstorm was, therefore, about 700 miles southeast of the center of the low-pressure area. A moderate southeast wind had prevailed during the night and had increased to 18 miles per hour after 5:00 a. m. About 7:20 a. m. the wind changed to southwest, blowing out of the approaching squall, and increased to 24 miles per hour. At the same time a heavy downpour began, 0.18 inch of rain falling in three min-

utes. The temperature dropped 12° and the barometer rose from 29.45 inches to 29.55 inches within a few minutes. Near the peak of the rise on the barogram appears a vertical mark, approximately ⅛ inch in length, caused by the concussion due to the explosion. This mark covers any record of an air billow or wave that may have traveled over the station. Such an air wave would traverse the distance to the station in about 12 seconds—too short a period to make a record on the barogram distinct from that made by the concussion.

The thunderstorm continued with moderate rainfall and occasional feeble lightning until 10:42 a. m. when the rain ended. The last lightning was observed at 8:30 a. m.

This storm was not severe and with the exception of the single heavy lightning discharge would not have called for comment, but the fire that was caused by the lightning burned five days and resulted in the loss of two lives and of property estimated by responsible officials of the oil company at $15,000,000. It also produced hundreds of violent whirlwinds, many of tornadic character and force, probably the strangest meteorological phenomenon ever noted in connection with a fire. In fact one of these whirls was responsible for the loss of life noted above.

Strong southerly winds prevailed all day on the 7th and until 12:20 a. m. on the 8th, shortly after midnight, when the wind veered into the west and a few minutes later into the northwest.

At the same time the first "boil-over" occurred; reservoirs Nos. 5, 6, and 7, and, according to some reports, No. 3 also, boiling over at the same time. These are all 750,000 barrel containers. They threw out an immense quantity of hot, burning oil which spread with remarkable rapidity over an area estimated by the engineers present at about 900 acres. The flames leaped seemingly a thousand feet in the air over the greatly increased area of the fire. At the same time violent whirlwinds began to form over the fire.

One of these whirlwinds left the vicinity of the reservoirs and traveling east-northeast about 1,000 yards picked up the Seeber cottage, just outside of the tank farm, lifting it several feet in the air and carrying it about 150 feet north, where it was dropped in a field, a total wreck. Mr. A. H. Seeber and his son, who were in the house, were killed. A daughter and a friend, who had just stepped out of the house, were carried some distance along the ground, but were not seriously injured. A barn, 100 feet south of the house, was not damaged. A few minutes later, a whirl, possibly the same one, tore the roof from the house of Mr. Banks, about one-fourth mile northeast of the Seeber home; it also demolished his garage and other outhouses, uprooted fruit trees, and drove a 2 by 4 inch beam, 16 feet long, through the boarded side of the pump house. An examination of the débris scattered around the Seeber and Banks places indicates clearly that the direction of rotation in these funnels was counterclockwise. Several of the fruit trees in the Banks yard, that were not uprooted, were twisted around in a counterclockwise direction until the boles cracked. Some of the whirlwinds, however, were reported as rotating in the opposite direction. At least two were observed, on the 8th during daylight hours, revolving in a clockwise direction. These were reported by eye witnesses who were in a position to observe them carefully.

Between 12:30 a. m. and 3:00 a. m. on the 8th, when the great sea of oil was burning and the tornadoes appear to have been most numerous, houses in San Luis Obispo, 2½ miles distant, shook as if a moderate earthquake were passing. Windows rattled vigorously and continuously and the Weather Bureau building swayed noticeably at times. The roar, even at that distance, was terrifying. Many residents refused to remain in their houses. About 3 a. m. these vibrations subsided.

From the time the wind veered into the northwest and the large reservoirs boiled over, hundreds of whirlwinds formed in and around the edges of the fire until the last tank boiled over on the morning of the 11th. During the period when the large reservoirs were burning and the temperature over the fire was probably at its highest point, and consequently the vertical convection was strongest, the whirls appear to have been most numerous and violent. Many of them had all the characteristics of true tornadoes. The gyrating, writhing, funnel-shaped clouds were viewed by thousands, the white, condensing vapor in the vortices making them plainly visible against the background of black smoke. Some of the funnels appeared to be not more than one foot in diameter at the smallest part, and some were reported as giving the impression of ropes dangling from the clouds of smoke.

About the time the Seeber house was destroyed, an employee of the oil company who had left his car standing near the Seeber barn started in that direction, but becoming alarmed at the roaring from the burning reservoirs, ran back to the Edna road and started toward town. Looking back he saw a "funnel" leave the fire and move toward the road, in a northeasterly direction. Near the mushroom-shaped top of the funnel, about 200 feet in the air, a small shed or chicken coop was floating around in a counterclockwise direction. Looking back occasionally as he fled Mr. Berry says that he saw at least 20 "spouts" between the Seeber house and the fire, some of them very small. He reports that a brisk northwest wind was blowing at that time, and that the roar from the whirlwinds was terrific.

It is believed that none of the tornadoes traveled more than 3 miles from the fire zone; some débris was found at that distance.

About 10:30 a. m. on the 8th, a tornado traveling from the reservoirs picked up Mr. Martin's house, about 300 feet north of the site of the Seeber home, and, according to spectators, raised it 300 feet in the funnel. It was carried about 100 feet northwest and dropped, completely demolished. A small range of hills about 500 feet in height lies northwest of the Martin house and may have been the cause of this tornado apparently traveling against the northwest wind. It is probable that an eddy formed in the lee of these hills.

Practically every explosion or "boil-over" of a reservoir or tank produced whirlwinds or tornadoes. Melted cast iron fittings found at the scene of the fire indicates a temperature of between 2,000° and 2,500° F.

The tank farm lies on the broad, level floor of San Luis Valley. From this valley the Los Osos Valley, a broad, level plain, trends northwestward to the ocean, about 13 miles from the tank farm. Northwest winds through this valley are of such strength that they have received the local name of "the Osos wind." On Sunday afternoon, April 11, when the writer visited the tank farm, he estimated the northwest wind then blowing across the farm at 40 to 50 miles per hour. It was with difficulty that one could walk around the rims of the large reservoirs. The wind velocity registered at the station at this time was 15 miles per hour. In view of the fact that the tornadoes were first noted just after the wind changed

from southerly to northwest it is possible that they may have been caused by the strong convectional currents over the fire being given a rotational motion by the northwest wind.

Property to the value of $15,000,000 was destroyed by fire and wind.

Supplementary note.—Mr. Hissong has sent to the editor five photographs of whirls that accompanied the oil fire. Since these probably constitute a unique record of a phenomenon which is rarely developed to the degree of intensity here met with, the photographs are reproduced, without retouching, and in the same size as the originals. They are arranged in what appears to have been the order in which they were taken.

Following, is an extract from Mr. Hissong's letter which accompanied the photographs:

It will be noted that the funnels were photographed after leaving the smoke pall that lay over the fire, the faint outlines of distant hills being visible in the background. Also that the funnels appear black in the prints although all accounts of eyewitnesses were to to the effect that they were white, or light colored. This is probably due to the fact that the funnels were between the camera and the sun * * *. The camera was pointing due south. The pictures were taken just after noon on the 8th.

Regarding the distance traveled by the whirls: Some dèbris was found on the slopes of the Santa Lucia range about 3 miles northeast of the fire. This range rises rather abruptly to a height of about 2,500 feet above the floor of the valley and undoubtedly some of the whirls were broken up by this range during the night of the 7–8th. No whirls were seen more than a mile from the fire during daylight hours.

Since writing the report I have learned that a house about 4½ miles south of the tank farm was unroofed about 7 a. m. on the 7th by a violent wind. This was probably the same storm that caused the fire. No lightning was noted in that vicinity, however, and nc funnel-shaped cloud was seen.

AEROLOGICAL EVIDENCE AS TO THE CAUSES OF TORNADOES

[Based on Dr. E. van Everdingen's "The Cyclone-like Whirlwinds of August 10, 1925," which was published in English in Proc. Koninklijke Akademie van Wetenschappen te Amsterdam, vol. 28, No. 10. Abstract and note by B. M. Varney]

It is remarkable that in the United States, more afflicted with tornadoes than any other area of equal size on the globe, the literature of tornadoes since Ferrel is confined almost exclusively to compilations of statistics on distribution, frequencies of occurrence, descriptions of resulting damage, and so on. We are therefore fortunate in being able to present excerpts from an aerological study by Doctor van Everdingen, of an extensive series of whirlwinds which caused widespread destruction in southern, central, and eastern Holland on August 10, 1925.

The paper opens with a brief statistical survey of whirlwinds of destructive violence in Holland. A total of 82 such has been recorded during the period 1882–1925. The monthly frequency was as follows:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	2	2	3	9	11	20	19	9	2	4	-----

For the great destruction of August 10, 1925, extensive evidence as to the direction of fall of trees and parts of buildings, distribution and shape of damaged areas, etc., leads to the conclusion that many whirls, decending to the earth's surface intermittently, were involved. None of them appears to have caused wreckage over paths of the lengths frequently found in the United States. The whirlwinds occurred in connection with the passage across the region of a trough of low pressure, accompanied by a thunderstorm of no unusual intensity.

Relative to the pressure distributions at the surface over Holland during the afternoon, there is presented a series of charts for 2, 4, 5, 6, 6:30 and 7 p. m. Commenting on these, Doctor van Everdingen says:

> Only at the moment of the passing of the whirlwinds extraordinary isobars are displayed, but these are very remarkable indeed, as in the neighborhood of the tracks of the whirlwinds, they indicate pressure gradients up to 55 mm. per degree, which, if occurring over larger areas and longer periods, would cause hurricanes of the most destructive kind.
>
> With isobars of curvature as here occurs, however, by far the greater part of the gradient is required for change of direction, and moreover it is evident that this pressure distribution did not persist long enough to develop its full wind force. There are no indications of the occurrence of similar gradients farther southwest before the whirlwinds appeared. Therefore though we don't exclude the possibility, that in the first place northwesterly gales and whirlwinds with a southerly track may be explained by these pressure gradients, we are of opinion, that on the whole these phenomena are to be regarded rather as sequences of than as causes for the formation of the whirlwinds. * * *

We turn to the aerological side of the study:

> In consequence of the constantly increasing application of the investigation of the upper air to the daily forecasts of the weather, we have at our disposal rather complete material of temperatures and velocities of the air in the lower kilometers. By means of aeroplanes the temperature was determined up to a considerable height at Duxford in England, Uccle in Belgium, Helder and Soesterberg in our country, by means of kites or cable balloons at Lindenberg and Friedrichshafen in Germany. Moreover, observations from mountain stations were available in Germany, Switzerland, and France. Numerous observations of pilot balloons give the wind directions in the higher strata at various times of the day.

The morning observations showed large differences of temperature between England and Central Europe at the 1,000 and 2,000 m. levels. Above the Puy de Dome in south central France the temperature was 68° F. at 1,500 m., and it is assumed that this temperature was characteristic of central France and that the southerly and southwesterly winds at that level later brought the warm air over Holland. The morning observation at Friedrichshafen on the Lake of Constance showed a steep lapse rate of temperature above 2,000 m. The assumption is made that this condition overspread Holland in the afternoon *above the warm air from the southwest*, accompanied by a temperature inversion at about 2,000 m., thus bringing about a condition which awaited only the lifting of the warm, moist air by underrunning of the much colder air from the west, to produce thunderstorms.

> As first demonstrated by Margules, the gravitational force accomplishes a considerable amount of work when cold masses of air, which first were found beside the warmer masses, spread out under these. With a vertical extension of the layers of 3,000 m. and a difference of temperature of 5° C. the whole mass of air may obtain a velocity of 12 m. p. s. The sudden outbreak of stormy winds during a thunderstorm may completely be explained in this way; but velocities of 50 m. p. s. are not easily reached in this manner; for these we want the cooperation of a heavy thunderstorm squall with a whirlwind.
>
> We now come to the observations which in our view contain the key for the explanation of the whirlwinds. The older theories, which for instance connected the whirlwinds with a rapidly rising current of air, which was said to cause vortices, or which ascribed them to the encounter of two strong wind currents of different directions in the same level, have been found to be failing in most cases. Rapidly rising currents often show no rotation at all. Air currents of very different direction and velocity occur in the same level generally only at distances, very large as compared with the diameter of a whirlwind. On the other hand it is shown daily that very different velocities may occur one *over* the other and that in that case, especially when inversions limit the turbulence, very sharp discontinuities may be found. Gradually it has become probable, that these discontinuities of the wind are necessary for the formation of vortices, and that these vortices therefore will rotate in the first instance about a horizontal axis, the higher parts showing the largest velocity in the direction of propagation. According to hydrodynamics, if friction is not considered, a vortex-thread can end only at the boundary of the fluid. Wegener and Krebs have made the supposition, that waterspouts and whirlwinds constitute the bent-down ends of the horizontal vortices in the

higher strata. If both ends are bent toward the earth, the end on the right of the horizontal vortex will show a cyclonic rotation (anticlockwise), the end on the left an anticyclonic rotation or right-hand rotation. The effect of the earth's rotation on the masses of air streaming towards the vortex will however favor the cyclonic rotation; moreover the other end may bend upwards and terminate at the inversion layer. As a matter of fact observation points to a preponderance of left-handed rotating whirlwinds. Of course the friction near to the surface will cause all kinds of complications—for instance it appears that often a division into a number of whirlwinds occurs.

If this view is correct, the formation of a whirlwind requires a discontinuity of the wind in the vertical and a strongly rising current, in which the discontinuity causes a horizontal vortex.* * *. If the whirlwind constitutes the vertical prolongation of a horizontal vortex, connected with the rising thundercloud, situated to the left of the whirlwind when looking in the direction of propagation, then the maximum precipitation must fall on the left side of the track. This is confirmed by [the distribution of precipitation which fell in connection with the storm]. To the right of the track are even places where no precipitation at all has fallen.

It remains to prove the existence of a considerable discontinuity of the wind. Indeed, in the afternoon of August 10 such a considerable increase of the wind upwards was observed as well at de Bilt as at Uccle, that at first an error was suspected. * * * The observation at de Bilt at 1:35 p. m. yielded the following results:

Height	500	1,000	1,500	2,000 m.
Velocity	5	13	20	31 m. p. s.
Direction from	190	200	220	220 degrees of azimuth

The observation at Uccle was made even later, 4:44–4:54, Amsterdam S. T., hence nearer to the disaster:

Height	500	1,000	1,500	1,800	2,000 m.
Velocity	16	24	36	41	36 m. p. s.
Direction from	218	222	226	224	223 degrees.

Lastly it appeared that in the morning in East-England, at Orleans and Brussels at heights from 2,000 to 2,400 m. velocities of 20 m. p. s. occurred between masses of air, moving slower as well further W. as further East. Hence there is no doubt, that a very important discontinuity of the wind occurred at a height of 2,000 m. leading to velocities of perhaps 40 m. p. s. about the time of the disaster. Such velocities are very rare, especially with a pressure distribution without large gradients at the surface—therefore we may ascribe the serious character of the disaster in the first place to this important discontinuity.

The cause of the local occurrence of such high velocities is to be found in the increase of the pressure differences at the level of 2,000 m., in consequence of the distribution of temperature, and in the increase of pressure differences at various levels by the secondary depression which passed over our country in the afternoon. * * * The difference in barometric pressure between S. England and Friedrichshafen, which in the morning amounted to 7 mm. at 2,000 m., to 10 mm. at 5,000 m., occurred probably in the afternoon over a distance shorter by one-third and was augmented by about 2 mm. by the secondary depression which must have had its origin at least partly in much higher strata. In this way we arrive at almost doubling the gradient, which hence reached a value of almost 3 mm. per degree, between Brussels and Friedrichshafen even more. This explains sufficiently velocities of such magnitude; the gradient wind at 2,000 m. was about 13 m. p. s. per mm. of gradient. * * *

It is evident from the foregoing, that for the formation of so heavy whirlwinds over a large region a rare coincidence of circumstances is required. We need not be amazed, therefore, that in order to find in our country a disaster, comparable with that of 1925, we have to go back to the very heavy whirlwinds of August 1, 1674, which made collapse a number of church towers and part of the cathedral at Utrecht.

NOTE.—For a concise summary of the theories which have contributed most to the discussion of tornadoes, the reader should consult Dr. Alfred Wegener's "Wind und Wasserhosen in Europa," especially chapter 15 on "Views as to the origin of whirlwinds." The thermodynamic and the mechanical theories are, naturally, discussed at greatest length. The thermodynamic, apparently first put forward by Benjamin Franklin in 1753 and thereafter elaborated by many meteorologists in Europe and this country, is reviewed largely on the basis of the work of Ferrel and of Sprung. It will therefore be appropriate here to quote the following statements (well known though they are) from Ferrel's "Recent Advances in Meteorology" (Report of the Chief Signal Officer for 1885, Appendix 71, pp. 324–325, and 327.)

It has been shown that there are two principal conditions upon which tornadoes depend, and that in the absence of either one of these they can not take place. The one is the state of unstable equilibrium of the air, and the other a gyratory motion with reference to any assumed center. * * * When we have these two principal conditions, the other, that there shall be some slight initial disturbance to cause the air to burst up at some point through the strata above, can scarcely ever be wanting. The places and times, then, in which these two principal conditions are found are those in which tornadoes are most likely to occur. * * * The unstable state of the air is most liable to be induced where surface winds from a lower latitude or any warmer region prevail while the normal temperature of the air above is not affected or at least increased in the same way. * * * In the southeast octant, within the cylconic part of the surface, the surface currents are from the south, bringing warm and moist air northward under the cold air currents above from the north. This increases the temperature below and decreases it above and gives rise to the large vertical gradient of temperature decreasing with increase of altitude which is necessary to the unstable state.

And this unstable state is of course precisely one of the conditions wherein can occur a discontinuity which, in the view of Wegener and Krebs, favors the formation of that horizontal vortex which is potentially a tornado in the making.

There seems to be some evidence, however, that a horizontal vortex might be produced under quite different circumstances. In "Wind und Wasserhosen in Europa" is a description of an experiment performed by Vettin in 1857, whereby he produced in a tank containing air *a horizontal vortex*, by first obtaining an *atmospheric discontinuity*, and then causing a *current to burst up through the discontinuity:*

In an oblong glass tank a circulation of the air was induced by placing a large piece of ice in one end. The air, the motions of which were made visible by means of tobacco smoke, then resolved itself into two layers moving in opposite directions. Now, if the bottom of the tank were warmed at point *c*, so that the air over it was elevated in the usual mushroom form, the resulting vortex ring was strongly distorted on the lee side (see *b* in diagram A of the figure) so that its rotation was weakened, while it became contracted on the windward side, at *a*. If now the warming were forced to a condition where the plane of the discontinuity was broken through (diagram B), the vortex ring on what is now the lee side at *a* is likewise distorted, and changed gradually into a surface vortex. In contrast to this, the previously distorted portion *b* contracts, since the motion of its upper part goes contrary to the upper current. Simultaneously its rotation is accelerated by the descent of air at *b*. In this situation, rolls or funnels are formed, which rotate about horizontal axes, and which, if the heating at *c* is slackened, are unwound (*herabgerollt werden*) by the descending air stream (diagram C) and finally dissipated.

The conditions of Vettin's experiment are clearly the reverse of those shown by Ferrel, and others since Ferrel, to favor the formation of tornadoes. In the experiment, the lower stratum is cold and the upper warm, a condition for stability.

Now, if one may draw a parallel between the above and the aerological conditions accompanying the whirlwinds discussed by Dr. van Everdingen, it is seen that corresponding to the convectional upthrust induced directly by Vettin's local heating there occurred over Holland convectional upthrusts induced secondarily by the under-running of cold air from the northwest. Further than this the conditions of Vettin's experiment do not apply, since the discontinuity most important in connection with the occurrence of the whirlwinds over Holland was not that between the underrunning cold surface air and the warm southwesterly air above, but between the warm southwesterly air and the overrunning cold air stream next higher up. Here was the condition

for instability. But a horizontal vortex was produced both in the experiment and in nature (if we assume the hypothesis of Wegener and Krebs to be correct). That is, it occurred regardless of whether the strata producing the discontinuity favored stability or instability.

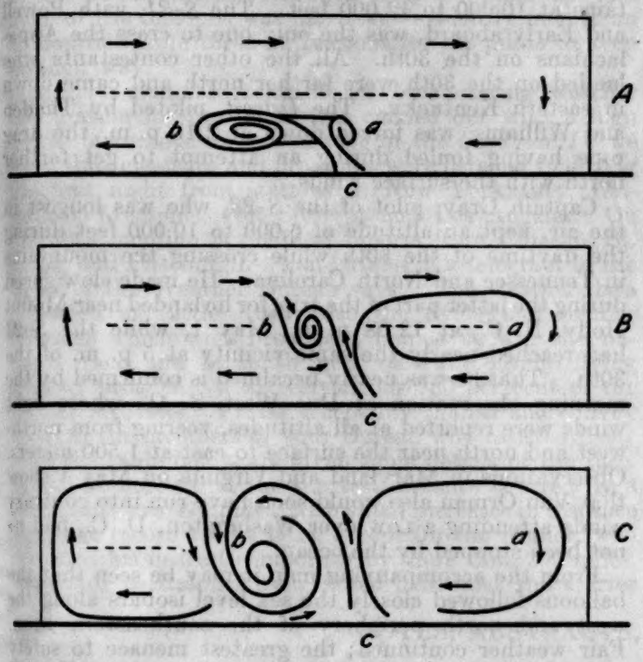

FIG. 1.—The experiment of Vettin: Forming a vortex by breaking through a discontinuity. (After fig. 85 in "*Wind und Wasserhosen in Europa.*")

In the phenomena discussed above, there seems to be a basis for believing that neither the thermodynamic hypothesis nor the mechanical, alone, adequately accounts for the inception of a tornado. Certainly the puncturing of a discontinuity, above and below which are winds of greatly contrasted velocity, by a convectional upthrust, suggests a query as to whether we may not expect further aerological investigation to show that both thermodynamical and mechanical principles must be invoked to solve the riddle. If such be the case, the view of Ferrel and others, according to which the thermodynamic principles play the major part, and the view of Wegener and Krebs with its emphasis on the mechanical, must share the honors of the middle ground. The example of Dr. van Everdingen's study of a special case may well be followed by other investigators.

Supplementary note.—Since the above material was prepared, Mr. J. E. Hissong's report on the tornadolike whirlwinds at the San Luis Obispo oil fire (see p. 161) has been received. The reader will note in the last paragraph of that report a statement concerning the apparent relation between the occurrence of the whirlwinds and the passage of a windshift line, a relation which, if one may judge from the necessarily scanty data, seems to have been closely similar to that discussed by Dr. van Everdingen. The oil fire certainly furnished no mean convectional upthrust. That the passage of the windshift furnished a discontinuity is probably almost certain. Mr. Hissong says: "In view of the fact that the tornadoes were first noted just after the wind changed from southerly to northwest it is possible that they may have been caused by the strong convectional currents over the fire being given a rotational motion by the northwest wind."—*B. M. V.*

THE NATIONAL ELIMINATION BALLOON RACE FROM LITTLE ROCK, ARK., APRIL 29, 1926

By JOHN A. RILEY

[Aerological Station, Broken Arrow, Okla.]

On the 28th, meteorological conditions ideal for the race began to be indicated and so it proved at Little Rock on the 29th, which was a warm, sunshiny day, with light southwesterly winds. Fair weather also prevailed quite generally over the Central and Eastern States, an unusually favorable condition considering that the region is normally visited by frequent rains and thundershowers at this season. With a bright moon throughout the night the pilots were able to recognize towns, rivers, and mountains and thus to know their positions at all times both night and day.

The meteorological controls in effect on the 29th were first to be recognized on the weather map of the 26th; a HIGH had appeared on the North Pacific coast and a LOW was moving eastward across Manitoba. Surface conditions on the day of the race were dominated by this HIGH, which had moved southeastward and now overlay most of the Southern and Eastern States, with a crest over the Ohio and lower Mississippi Valleys. Sea level isobars extended nearly straight NE–SW. Meanwhile the northern LOW had moved eastward across the lake region and was located over New Brunswick on the 29th. It had brought considerable cold air over the Northeastern States, while the Southwest was enjoying the mild tem peratures of early summer. The resulting temperature differences in the free air caused, above 1,500 meters, a cyclonic system of winds centered over New England and covering the country from the Mississippi Valley eastward.

Northwesterly winds therefore prevailed in the upper levels while below 1,000 meters the winds conformed nearly to the sea level isobars, i. e., they were SW. to WSW. over Arkansas and nearly west farther north and east. An observation at Little Rock at noon showed typically light winds to 2,000 meters, from west to southwest below 1,000 meters, and northwest above.

The balloonists could have chosen a course variously from northeast to southeast depending on the altitude, but the northwesterly wind could be ruled out of consideration not only because its speed was decreasing but because even had strong winds persisted a record breaking distance could not have been made in that direction before reaching the Gulf coast. Southerly component winds were greatly to be preferred.

The race was therefore necessarily a low altitude one at least at the beginning; to gain the greatest final distance it was desirable to make as much northing as possible the first night, as it was strongly indicated that westerly winds then prevailing over the Ohio Valley would continue for some time, and that little or no further progress northward could be made after reaching that region or during the second night. Thus, other conditions being favorable, the Atlantic might be the limiting factor for distance. This proved to be true for Mr. Van Orman, the winner, who decided to land when he sighted the lighthouse of James Bay shortly after midnight, May 1.

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As the wind was light during the afternoon the inflation of the balloons was an easy task and the take-off was as gentle as perfect equilibrium could make it. There were nine contestants, each with a balloon of 35,000 cubic feet foot capacity. A tenth balloon, the *Skylark*, of 20,000 cubic feet, was the pilot. It left at 4:25 p. m., taking a course ENE., changing to NE. as it gained altitude. The first contestant, the *S–21*, rose at 5 p. m. and the others followed precisely at five-minute intervals. The *Skylark* was lost to view before the departure of the others, which were all visible as they drifted northeastward a few hundred feet above the horizon.

Each pilot was supplied with current meteorological data before his departure. This included the morning weather map and auxiliary charts prepared by the Weather Bureau office at Little Rock. Telegraphic reports based on special noon observations at aerological stations were plotted at the field on a series of small outline maps showing the wind at various levels; each pilot carried a copy of these.

On the basis of current observations the contestants were advised to fly at an altitude somewhere near 500 meters, in order to gain the greatest northward drift and the greatest speed, for in this region night winds with southerly components show a well marked tendency to build up a maximum velocity near that level. (See Gregg: *Aeronautical Meteorology*, p. 47.)

A pamphlet on "Normal Flying Conditions in Arkansas during April and May" had been prepared by Mr. Gregg for the contestants. Some of its instructions were so applicable to this race that further information could have been dispensed with. For instance: "The best altitude for flying at night is normally about 500 meters, where in this section of the country, a fairly steady southerly wind often prevails. During the daytime better flying conditions usually are found at a greater altitude, 1 to 3 kilometers or higher."

Several of the contestants, including Van Orman, Boettner, Thaden, and others, reached equilibrium at 300 to 500 meters where they found the wind they desired carrying them to the northeast. They crossed the Mississippi River near Cairo at midnight and later and were carried thence nearly eastward across Kentucky. At least one balloon, the *S–23*, which flew at a higher altitude, and the *Skylark*, flying only a little above the tree tops, were carried more to the east into Tennessee.

By the morning of the 30th the southeastern HIGH extended as a ridge from Mississippi eastward and far out to sea. With another LOW moving eastward across the lake region, isobars were nearly east–west over Kentucky and Tennessee where the balloons were then located.

As the surface winds had a slightly stronger south component than the winds higher up, the pilots were confronted with the following problem: They might continue to fly at the same low altitude, in which case, on account of daytime convection, the chances were that while better progress might be made, a serious loss of ballast would be necessary to overcome the effects of vertical currents. If they rose higher, thus sacrificing somewhat of speed and direction, they would be in a better position to remain in the air longer.

As most of the contestants dropped out during the afternoon of the 30th, it is evident that the fight with convection was too much for their ballast supply. Pilot Naylor, of the *Skylark*, and his aid, who early on the first evening ran into trouble by catching their drag rope in the top of a dead tree, from which they extricated it with difficulty, decided to land about noon, when from an altitude of 6,500 feet the timbered slopes of the mountains of eastern Tennessee loomed ahead. Boettner, farther north, landed near the foothills of the Appalachian Mountains in southern West Virginia at 7:45 p. m., after passing over the Cumberland Mountains at 10,000 to 12,000 feet. The *S–21*, with Powell and Early aboard, was the only one to cross the Appalachians on the 30th. All the other contestants who landed on the 30th were farther north and came down in eastern Kentucky. The *Detroit*, piloted by Thaden and Williams, was forced down at 2:10 p. m., the drag rope having fouled during an attempt to get farther north with the surface winds.

Captain Gray, pilot of the *S–23*, who was longest in the air, kept an altitude of 6,000 to 10,000 feet during the daytime of the 30th while crossing the mountains in Tennessee and North Carolina. He made slow speed during the latter part of the trip, for he landed near Mount Holly, N. C., at 12:08 p. m., May 1, while the *S–21* had reached nearly the same vicinity at 5 p. m. of the 30th. That he was nearly becalmed is confirmed by the morning observation at Due West, S. C., where light winds were reported at all altitudes, veering from northwest and north near the surface to east at 1,500 meters. Observations in Maryland and Virginia on May 1 show that Van Orman also would soon have run into contrary winds attending a LOW over Washington, D. C., had he not been stopped by the ocean.

From the accompanying map it may be seen that the balloons followed closely the sea level isobars along the west and north periphery of the southeastern HIGH. Fair weather continued; the greatest menace to safety

FIG. 1.—Sea level isobars, wind directions at 1,000 meters, and paths of the three balloons making greatest distance, National Elimination Balloon Race, from Little Rock, Ark., April–May, 1926

in free-ballooning, the thunderstorm, was absent; thunderstorms were reported in Pennsylvania, however, during the night of April 30–May 1. No serious accidents marred the race, although the press reported that Lieutenant Gray was injured, his clothing ruined, and the

balloon, *S-20*, damaged when it was forced down into trees near Reedville, Ky.

A new menace, nonmeteorological in character, was reported by some of the pilots: while they were sailing over the mountains of Kentucky and Virginia, several of the mountaineers proceeded to shoot them up. As none of the balloons was hit, it was evidently merely an admonition from these native sons for the pilots to keep on their way.

A very complete schedule of broadcasting weather information for the pilots was carried out with a high degree of success. From the log of the *Goodyear IV* we learn that messages and programs were listened to during the first night from stations in New York City, Cincinnati, Memphis, Hot Springs, and Los Angeles. On the 30th mention is made of reports from Chicago, St. Louis, and Pittsburgh. Van Orman in a telegram to the Chief of the Weather Bureau says, "The weather data furnished at Little Rock, also the flying and regular forecasts which were broadcast, helped us win the national race and establish new records. Every flying forecast broadcast was received, also 80 per cent of the regular forecasts. Please accept my thanks and convey them to the members of your Bureau who assisted."

In the table below are given some details of the race. It will be noted that the shortest distance covered by a contestant was 473 miles, with small increases in distance from one record to the next, except for the winner, who exceeded his nearest competitor by more than 200 miles. According to Ralph Upson, noted balloonist and starter of the race, the previous record for balloons of this size was 305 miles; even the smaller *Skylark* exceeded this by more than 100 miles.

Name of pilot and aid	Entrant	Name of balloon	Place and time of landing	Distance
				Miles
W. T. Van Orman (W. W. Morton).	Goodyear Tire & Rubber Co., Akron, Ohio.	Goodyear IV	8 miles SSE. of Petersburg, Va., 1:03 a. m. May 1.	848
Capt. H. C. Gray (Lieut. D. Johnston).	U. S. Army Air Service, Scott Field, Ill.	S-23	7 miles N. of Mount Holly, N. C., 12:08 p. m. May 1.	635
J. A. Boettner (H. W. Maxson).	Akron Chapter N. A. A., Akron, Ohio.	Akron N. A. A.	7 miles NE. of Welch, W. Va., 7:45 p. m. Apr. 30.	627
Lieut. James F. Powell. (Lieut. James F. Early).	U. S. Army Air Service, Phillips Field, Md.	S-21	12 miles due N. of Hickory, N. C., 5 p. m. Apr. 30.	618
Herbert V. Thaden (C. D. Williams).	Detroit Flying Club, Detroit Aviation Society.	Detroit	3 miles W. of Gulnare, Ky., 2:10 p. m. Apr. 30.	574
Lieut. Wm. A. Gray. (Lieut. R. Kleburtz).	U. S. Army Air Service, Langley Field, Va.	S-20	Reedville, Carter County, Ky., — p. m. Apr. 30.	570
Svend A. U. Rasmussen. (Edward J. Hill).	Detroit Adcraft Club, Detroit, Mich.	Detroit Adcraft.	3 miles W. of Blaine, Ky., 5 p. m. Apr. 30.	566
Capt. L. F. Stone (Capt. G. R. Oatman).	U. S. Army Air Service, McCook Field, Dayton, Ohio.	S-19	7 miles SE. of Heidelberg, Ky., 2:30 p. m. Apr. 30.	510
Walter A. Ham (Robt. P. Lehr).	Walter A. Ham, Los Angeles, Calif.	Goodyear Southern California.	5 miles E. of Brodhead, Ky., 11 a. m. Apr. 30.	473
W. C. Naylor (K. W. Warren).	The Arkansas Gazette, Little Rock, Ark.	Skylark (pilot balloon).	4 miles N. of Crawford, Tenn., 11:30 a. m. Apr. 30.	410

NOTES, ABSTRACTS, AND REVIEWS

EXTRAORDINARY APRIL RAINS IN CALIFORNIA

The unprecedented rains in some parts of California in April, 1926, call for some mention of the attendant meteorological conditions.

On April 1, five days previous to the arrival of the rains, a weak cyclonic system was charted in W. longitude 150°; N. latitude 30°; associated therewith was an anticyclone, centered in W. longitude 160°; N. latitude 50°. The latter, being in the more rapidly flowing eastward drift of the higher latitudes, advanced to the Mackenzie Basin by the evening of the 4th. Meanwhile the more slowly moving oceanic cyclone had increased considerably in intensity and it continued further to increase, reaching its maximum development on the morning of the 7th in W. longitude 135°; N. latitude 45°. Twenty-four hours previously an offshoot from it had passed inland over California giving the general and heavy rains as above noted.[1]

The oceanic cyclone on the morning of the 8th occupied practically the whole of the Pacific north of N. latitude 30 and east of W. longitude 170°; it also had encroached upon the continent as far as W. longitude 120° in Alaska and 110° in northwestern Mexico.

If, in the beginning, the position of the cyclone and anticyclone had been reversed, as is normally the case in that part of the Pacific, very little, if any, precipitation would have occurred in California. It is a basic maxim in the forecasting of precipitation in this country that the conditions are most favorable when the geographic position of the cyclone and the anticyclone is such that the former is to the southwest of the latter.

This position was reached on the 5th and 6th and although the centers of the two formations were spearated by at least 30° of latitude the result was never in doubt and was quickly foreseen by the San Francisco forecaster. The chief meteorological factor concerned in the causation of the rains in question was the relative position in time and space of the two barometric formations above described.

As has been pointed out, that position was the exact opposite of the one normally to be expected, viz, high pressure over the northeast Pacific in approximately, W. longitude 148°; N. latitude 32°, in April and it was this abnormal pressure distribution that led to the rains in California.

The fact that heavy April rains have occurred once within the 50-odd years of observation can not, however, be interpreted to mean that similar heavy rains will occur in the next 50 years. It is within the range of probability that several occurrences of heavy rains in April may be experienced in the next 50 years and on the other hand there may not be a single occurrence.—*A. J. H.*

[1] Cf. Reed, T. R., p. 181 of this REVIEW.

RAIN SQUALLS OF THE ATLANTIC TRADE-WIND REGION

K. Knoch, in Publication No. 335 of the Prussian Meteorological Institute (Berlin), 1926) discusses certain aspects of the temperature and relative humidity observations obtained by the late E. Barkow on board the ship *Deutschland* in the Atlantic trade-wind region during June, July, and August, 1911.

The rain squalls are phenomena apparently not related to the ordinary trade-wind cumulus. They occurred between latitudes 25° and 20° N. with a frequency averaging 1.9 per day, 3 per day between latitudes 20° and 15°, and 2 per day between 15° and 10°. In the 5-degree belt north of the Equator the frequency was 1, in 0° to 5° S. it was 3, dropped to 1.1 between 5° and 10° S., rose to 3 in the belt 10°–15°, and to 4 per day between 15° and 20° S. These figures are based, of course, on

meager data, but, at least for this period, indicated a maximum rain squall frequency for the northeast trade-wind zone between 20° and 15°, and beyond 5° S. a distinct increase in frequency toward the higher latitudes. It is to be noted that the observations in the latter group were made during the Southern Hemisphere winter.

The normal trade-wind curve of temperature, while extraordinarily steady, nevertheless is made up of a multitude of tiny changes; and corresponding to these the trace for relative humidity seesaws constantly through a range of largely 2 to 5 per cent (occasionally reaching 8 to 10), these oscillations being superposed upon the very small diurnal swing.

The curves for temperature and relative humidity in the rain squalls are unmistakably different from these normal trade-wind curves, and they strongly resemble those made over a heated land surface. They seem to show clearly that isolated bodies of cold air exist in the otherwise uniformly turbulent trade-wind stream, the instability which they help to produce being altogether more marked at the surface than the normal instability which produces the trade-wind cumuli.

Two general types of temperature change occur with the rain squalls:

1. A fall lasting 2 to 4 hours, usually irregularly. It is sometimes interrupted by a slight rise, after which the approach to the minimum is more rapid than before. Recovery of normal temperature may be either slow or rapid.

2. A type requiring at the most three-quarters of an hour for the completion of the changes during the passage of the ship through the body of cold air, sometimes scarcely 20 minutes.

There was one very special case (June 29, in latitude about 23° N.) differing from the above types. First occurred a slight cooling incident to a strong northerly squall with light to moderately heavy rain, and then came a sharp rise of temperature to above normal upon the veering of the wind into the ESE. The author suggests that this rise was due to the thrusting northward of warm air from lower latitudes in some manner connected with the passage of the cold air. Adequate discussion of this case was impossible, however; observations on wind direction were taken only at 4-hour intervals.

With regard to occurrence of the rain squalls in the southeast trades, the *Deutschland* registrations show clearly that the cold-air masses reached to 6° S. They have been observed with southeast wind on the South American coast northeast of Pernambuco.

The author regards these cold-air bodies as remnants of larger air masses thrust forward from high latitudes to and in part within the trade-wind boundaries, their breaking up giving opportunity for the rain squalls. He points out that this is, in a sense, nothing new, for it is well known that in winter, polar-air streams now and then reach almost to the Equator. The registrations discussed are, however, of special interest because they are the first automatic records from the Atlantic showing cold-air thrusts into the trade-wind zones.—*B. M. V.*

AN UNDERDEVELOPED TORNADO

By G. SHIPMAN

[Weather Bureau Office, Fort Smith, Ark., May 24, 1926]

An underdeveloped tornado closely followed by a straight blow occurred at Fort Smith, Ark., during the late afternoon of April 23, 1926. It developed at the front of an advancing HIGH on the wind-shift line accompanied by a sharp drop in temperature. The sky was clear until 4:30 p. m. when it changed to partly cloudy, becoming cloudy at 5:30 p. m. A few alto-stratus clouds from the south were observed until 4:30 p. m., changing then to lower clouds with a dense bank to the north. At 5:30 the clouds became denser, with a small turbulent mass of mammato-cumulus moving from the south. The lower clouds moved from south to north, while the higher ones, when observed, moved from west to east along the path of the storm. Lightning, starting at 5:30 p. m., was vivid during the entire storm, the flashes, mostly perpendicular, passing from higher clouds through scud to the earth. The tornado cloud appeared at Fort Smith at 6:15 p. m., earlier to the west, and later to the east. It was observed by several persons, as a dense bank of greenish clouds with a narrow rope-like pendant. The pendant cloud rose and fell, seldom touched the earth, moved slowly, taking about three minutes to pass Fort Smith, dissolved to a mass of scud occasionally and reformed again at intervals of some miles. Light precipitation and light hail accompanied the storm. Moderate southerly winds prevailed during the day increasing after 6:00 p. m., attaining an extreme velocity of 61 miles at 6:26 p. m. and a maximum velocity for five minutes of 49 miles from the northwest at the same time. The wind shifted often during the storm and remained northwest to west afterwards. The pressure curve showed weak tornado features with a short, sharp drop before the storm and a rise of 0.30 inch in three hours following. Two persons in ordinary buildings in the path of the storm described the passage of the cloud over them as violently shaking the buildings without causing serious damage. The damage resulted from a straight blow that followed the storm by about 10 minutes. A five-month infant was killed at Branch, Ark., and about $10,000 damage was done at Fort Smith, with one person slightly injured. The storm's path was very narrow and extended from Salisaw, Okla., to Branch, Ark., about 52 miles. The débris and damage in the path showed straight blow effects as did instrumental records and direct observations. Had this storm occurred at night without observation of the tornado cloud probably no tornado would have been reported. Only persons near the tornado cloud heard any attendant noises.

ARCTIC ICE IN 1925

[Reprinted from *Nature*, London, April 17, 1926]

The Danish Meteorological Institute has published its annual report on the state of the ice in the Arctic seas.

As usual, the data are most numerous from the Barents Sea, Spitsbergen, the west coasts of Greenland and Alaska, but in 1925 a good deal of information was available from the east coast of Greenland. From the Beaufort Sea and the coast of Siberia practically no data came to hand. The most notable feature of the year was the unusually small amount of ice observed in practically all the Arctic seas that were visited. During the summer, the Barents Sea was free from ice and the Kara Sea was remarkably open. Spitsbergen waters were very clear, and during August there was open water round practically the whole of the group. Franz Josef Land, as usual, was more or less inaccessible but there was open water on the north of Novaya Zemlya in August. On the east coast of Greenland the ice belt was narrow, and there appears to have been less drift from the north than usual. Bering Strait was open in June, but the north coast of Alaska not until late in July. Commander C. I. H. Sperrschneider, the editor of the report, comments on the facts that for several years, particularly in 1925, little old ice was found in the east Greenland or east Spitsbergen currents, and that most of the ice was of one winter's formation.

AURORA OF APRIL 14, 1926

Several reports of a brilliant aurora observed on the above date have come to the editor. The observers were located in Oregon, Wyoming, Nebraska, central Illinois, the Northeastern States and as far south as Fort Myers, Florida.—*A. J. H.*

METEOROLOGICAL SUMMARY FOR BRAZIL, MARCH, 1926

Condensed from translation by W. W. Reed of the *Summario da circulacão atmospherica no Sul e Centro do paiz*, in the Monthly Bulletin of the Meteorological Office, Rio de Janeiro]

The circulation in the lower atmospheric layers was much more intense in March than in February. The southern part of the continent was invaded by six anticyclones, and the continental depression and those of high latitudes were especially active. The anomaly noted in February continued in March—the systems of high pressure still moved in the direction of the meridians and weakened as they advanced. The semipermanent anticylcone of the Atlantic continued its influence over the continent. The weather was very much unsettled and abundant rains fell in the central part of the country.

On the 1st, southern Brazil was dominated by a HIGH and the northern and central regions of Argentina by a LOW, while another HIGH lay over the southern part of the continent. This last system moved northeastward, bringing fresh southeast winds in extreme southern Brazil and the adjacent part of Argentina on the 2d. The first invading HIGH appeared in the western part of Argentina on the 6th, remained more or less stationary until the following day, and then after moving in an abnormal course toward the east it finally turned northeastward and merged on the 9th with the anticyclone previously mentioned. The second anticyclone invaded Argentina on the 12th and moved rapidly northeastward. Depressions were very active on the 10th and 11th. On the 16th a third HIGH was built up over the southern part of the continent, and on the following day merged with the second anticyclone, the center of the resulting formation remaining over Argentina. The fourth anticyclone appeared in southren Argentina on the 18th, and, though weakened, moved east-northeastward.

On the 22d the fifth HIGH lay over southwestern Argentina; on account of the activity of the continental depression it lost intensity, but moved east-northeastward, and on the 25th remained as a small center of high pressure in southern Brazil, after which it again moved northeastward. On the 29th central Argentina felt the influence of the sixth anticyclone, which also moved northeastward. Depressions were rather active on the 27th and 28th.

METEOROLOGICAL SUMMARY FOR SOUTHERN SOUTH AMERICA, MARCH, 1926

By SEÑOR J. B. NAVARRETE

[El Salto Observatory, Santiago, Chile]

(Translated and slightly condensed by B. M. V.)

In this month Chilean rainfall increased considerably, and temperatures in general were lower in the central zone.

Up to the 6th there were no important departures from normal, the center of high pressure oscillating between Chiloe and Cabo Raper.

On the 7th a pressure decline began in the central zone on account of the approach of an important depression from the west, which by the 9th began to affect the continent, causing violent winds and rain in the southern zone, the center of the depression being located near Juan Fernandez with an observed minimum pressure of 752 mm.; on the 10th it was opposite the island of Huafo with pressure 744 mm., and rain extended to Aconcagua Province in central Chile. During the 11th the depression moved southward, pressure falling to 735 mm. at Punta Arenas, with bad weather. There was an interval of calm on the 12th and 13th, but on the 14th and 15th a new depression caused rains as far north as Valdivia, where 22 mm. were recorded.

From the 16th to the 23d an anticyclone dominated southern Chile, with general fine weather.

Another depression brought rains and high winds to southern Chile between Concepcion and Magallanes on the 25th to 28th, causing a general rise of the rivers. The heaviest precipitation of the month was registered at Valdivia on the 27th, 103 mm. in 24 hours. After an interevning period of higher pressure, rains occurred again over southern Chile on the 30th and 31st, the maximum precipitation of 56 mm. occurring at Valdivia.

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SOLAR OBSERVATIONS

SOLAR AND SKY RADIATION MEASUREMENTS DURING APRIL, 1926

By HERBERT H. KIMBALL, Solar Radiation Investigations

For a description of instruments and exposures and an account of the method of obtaining and reducing the measurements, the reader is referred to the REVIEW for January, 1924, **52**:42, January, 1925, **53**:29, and July, 1925, **53**:318.

From Table 1 it is seen that solar radiation intensities averaged above April normals at Washington, and slightly below at Madison and Lincoln. At Washington, a noon reading of 1.53 gr. cal./min./cm ²./, on the 9th is slightly higher than any intensity heretofore measured at that station in April, and higher than the maximum that has heretofore been measured in any month except March, 1926.

Table 2 shows that the total solar and sky radiation received on a horizontal surface averaged decidedly above the April normal at all three stations for which normals have been determined. The weekly averages for Chicago are omitted pending a redetermination of the constants of the recording pyrheliometer at that station.

Skylight polarization measurements made at Madison on the 26th, give a polarization of skylight of 60 per cent. At Washington, measurements made on three days give a mean of 65 per cent, with a maximum of 66 per cent on the 16th. These are above the average April values for Washington.

TABLE 1.—*Solar radiation intensities during April, 1926*

[Gram-calories per minute per square centimeter of normal surface]

Washington, D. C.

Date	Sun's zenith distance: 8 a.m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	Noon
	75th mer. time	Air mass: A. M.					P. M.				Local mean solar time
	e.	5.0	4.0	3.0	2.0	[1] 1.0	2.0	3.0	4.0	5.0	e.
	mm.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
Apr. 1	3.81						1.21				2.87
2	3.00					1.43					2.74
9	6.50			1.06	1.26	1.58	1.30				3.81
10	3.63			1.08	1.18	1.47					2.49
12	2.16			0.96							3.30
15	4.37						1.24				3.00
16	4.75	0.72		0.97	1.18	1.44					4.37
20	2.06	0.79	0.80	1.00	1.10						2.06
21	3.99					1.20	0.84				3.45
26	3.81				1.11						3.15
27	4.17		0.44	0.63	0.90						2.87
29	3.99				0.91						3.63
Means		(0.76)	(0.66)	0.95	1.09	1.42	1.15				
Departures		+0.06	−0.09	+0.07	+0.03	+0.07	+0.06				
Madison, Wis.											
Apr. 5	2.16			1.19	1.39	1.60					2.03
8	3.15		1.00	1.12	1.30	1.50	1.13				3.00
10	3.81				1.07						5.36
12	2.87			0.80	1.05						3.00
13	2.87				1.16						3.30
15	2.36				1.24						2.74
16	4.57				1.31	1.52	1.13				3.45
19	3.15				1.11	1.33					4.39
26	4.17			1.16	1.33						3.45
30	5.79					1.22					7.04
Means			(1.00)	1.07	1.22	1.43	(1.13)				
Departures			−0.04	−0.02	±0.00	+0.01	−0.09				
Lincoln, Nebr.											
Apr. 3	2.16		0.95	0.98	1.29						1.68
12	4.57		0.64	0.89	1.17	1.44	1.22	1.03	0.88	0.77	4.17
13	4.17	0.65	0.74	0.90	1.15	1.38					4.57
14	3.00					1.47	1.28	1.10	0.96	0.85	2.62
15	2.36	0.61	0.72	0.96	1.25	1.51	1.20	0.98	0.81	0.72	2.74
18	3.63	0.63	0.72	0.88	1.17	1.50	1.17	0.92	0.75	0.60	2.87
19	2.74		0.68	0.80	1.28						2.16
28	2.62						0.91				2.26
29	4.57					1.34					4.57
30	8.48	0.52	0.64	0.82	1.04	1.32	1.00	0.79	0.67	0.55	6.76
Means		0.60	0.73	0.89	1.19	1.42	1.13	0.96	0.81	0.70	
Departures		−0.13	−0.09	−0.09	−0.02	−0.02	−0.04	−0.01	−0.02	±0.00	

[1] Extrapolated.

TABLE 2.—*Solar and sky radiation received on a horizontal surface*

[Gram-calories per square centimeter of horizontal surface]

Week beginning—	Average daily radiation: Washington	Madison	Lincoln	Chicago	New York	Average daily departure from normal: Washington	Madison	Lincoln
1926	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
Apr. 2	370	437	358	-------	250	−24	+82	−73
9	412	545	533	-------	387	+3	+177	+97
16	516	540	564	-------	415	+94	+156	+128
23	466	413	500	-------	318	+39	+8	+38
Excess or deficiency since first of year on Apr. 29						+693	+1,400	−679

WEATHER OF NORTH AMERICA AND ADJACENT OCEANS

NORTH ATLANTIC OCEAN

By F. A. YOUNG

While over the greater part of the ocean the number of days with gales during April was less than during March, it was above the April normal over the greater part of the steamer lanes, as well as in southern waters from the Azores to Gulf of Mexico.

Fog was unusually prevalent over the Grand Banks and off the American coast north of the Virginia Capes, where it was reported on from 7 to 11 days. The number of days with fog was apparently not far from normal over the steamer lanes and off the European coast, while it occurred on 3 days in the western part of the Gulf of Mexico.

TABLE 1.—*Averages, departures, and extremes of atmospheric pressures at sea level, 8 a. m. (75th meridian), North Atlantic Ocean, April, 1926*

Stations	Average pressure	Departure[1]	Highest	Date	Lowest	Date
	Inches	*Inch*	*Inches*		*Inches*	
Julianehaab, Greenland	[2] 29.29	—	29.85	29th	28.43	13th.
St. Johns, Newfoundland	29.73	−0.14	30.30	25th	29.34	16th.
Nantucket	29.92	−0.06	30.32	13th	29.38	1st.
Hatteras	30.02	+0.01	30.26	10th	29.76	17th.
Key West	30.04	+0.02	30.22	21st	29.90	12th.
New Orleans	30.07	+0.07	30.28	20th[3]	29.72	7th.
Swan Island	29.91	−0.07	29.98	25th	29.82	12th.
Turks Island	30.08	+0.06	30.18	22d[3]	30.00	17th.
Bermuda	30.14	+0.14	30.46	7th	29.78	17th.
Horta, Azores	30.12	+0.01	30.52	16th	29.12	1st.
Lerwick, Shetland Islands	29.83	+0.03	30.23	2d	29.10	15th.
Valencia, Ireland	29.85	−0.04	30.22	24th	29.38	20th.
London	29.87	0.00	30.27	5th	29.32	20th.

[1] From normals shown on H. O. Pilot Chart, based on observations taken at Greenwich mean noon, or 7 a. m., 75th meridian.
[2] Mean of 26 observations; 4 days missing.
[3] And on other dates.

The station at Julianehaab on the south coast of Greenland has been recently established, and therefore no normal is available. According to Bartholomew's Atlas the normal for that vicinity is approximately 29.85 inches. The average of 29.29 inches for 26 days, as shown in the table, appears to be suspiciously low, especially as there were no signs of any cyclonic disturbance in that region. The maximum force of wind was SSE. 7 on the 19th, while either calms or winds of force 1 were reported on 11 days.

Charts VIII to XI cover the period from the 1st to 4th, inclusive, and give an idea of the disturbance that was over the eastern section of the ocean during the latter part of March.

On the 5th the LOW that had been off the New England coast on the previous day was over the west coast of Newfoundland and westerly gales prevailed in the southern quadrants, while heavy weather was also encountered between the 55th meridian and the Bermudas. The central disturbance of the 4th moved but little during the next 24 hours and on the 5th was central near 50° N., 30° W. It had diminished in intensity and moderate weather was the rule over the greater part of the ocean, although winds of force 7 were reported over the eastern section of the steamer lanes.

On the 5th and 6th there was a severe disturbance in the Mediterranean, and on the former date the Belgian S. S. *Emanuel Nobel* reported a northwest wind, force 10, near 30° N., 23° E.

From the 5th to the 6th the western LOW moved but little while the central depression drifted eastward and on the latter date was central near 55° N., 25° W. Moderate winds prevailed for the most part, although westerly gales occurred over a limited area in the southerly quadrants of both LOWS.

On the 7th the western depression was central near St. Johns, Newfoundland, and the eastern off the south coast of Iceland. Moderate to strong westerly gales were reported between the 40th and 45th parallels and 35th and 60th meridians, as well as over the eastern section of the steamer lanes. On the 7th there was also an area of low pressure in the Gulf of Mexico, and while light to moderate winds prevailed at the time of observation, winds of gale force were reported later in the day.

The western LOW moved rapidly eastward, and on the 8th the center was near 50° N., 35° W., with gales over the area between the 40th and 50th parallels, and the 20th and 40th meridians.

At the time of observation on the 8th, light winds prevailed off the east coast of Florida, but later in the day the American S. S. *M. F. Elliott* encountered a very severe electrical disturbance there (see table). On the afternoon of the same day the American steamship *Western Plains* ran into another severe storm between Halifax and Nantucket, which on the morning of the 9th was central near Sable Island. On the 9th a second LOW was central near 45° N., 35° W., and gales occurred over a large section of the steamer lanes, west of the 30th meridian.

By the 10th these LOWS had apparently joined forces, and while on that date, as well as the 11th, favorable weather prevailed west of the 50th meridian, westerly to northwesterly gales were reported from a limited area between the 40th and 45th parallels and 35th and 50th meridians.

This disturbance moved little during the next 24 hours, but by the 12th the storm area had increased in extent and intensity, with moderate to strong southwesterly to westerly gales between the 40th and 50th parallels and 30th to 50th meridians. On the 13th the center was near 52° N., 27° W., and on this date and the 14th the storm area covered the greater part of the steamer lanes east of Newfoundland. On the 15th the low pressure lay between Scotland and Iceland, and on that date and the 16th the eastern section of the steamer lanes was swept by moderate to strong westerly gales.

On the 15th Father Point was near the center of a LOW, with a secondary LOW near 37° N., 60° W., where strong westerly gales were reported.

On the 16th there was a slight depression near Charleston and while moderate weather prevailed at time of observation winds of gale force were reported later in the day.

On the 17th there were two well developed depressions; one over the Province of Quebec and the other off the north coast of Scotland. Except as indicated by a few widely scattered reports of winds of force 7 favorable weather prevailed over the entire ocean.

On the 18th the center of the western LOW was near St. Johns, Newfoundland, while the eastern depression had moved but little since the 17th. Gales from the south prevailed over a limited area between St. Johns and the 40th meridian and from the north over the eastern section of the steamer lanes.

On the 19th favorable weather was the rule, although a few reports of moderate gales were received from vessels in mid-ocean.

On the 20th there were two well-developed depressions, the first central near Halifax, and the second over England. Moderate gales swept over the region between the Bermudas and Canada and also over the eastern section of the steamer lanes.

On the 21st the western LOW was over the west coast of Newfoundland while the eastern depression had moved but little since the previous day. Both of the storm

areas of the 20th had diminished in extent and moderate weather prevailed over the greater part of the ocean. By the 22d the western LOW alone remained within the limits of the chart, and was central near St. Johns, Newfoundland. The storm area of the previous day had practically disappeared, although a maximum wind force of 7 was reported by a few vessels in widely scattered localities.

From the 23d to 26th favorable conditions prevailed over the entire ocean, with the exception of a gale on the 25th in the vicinity of the English Channel.

On the 27th a LOW was central near Belle Isle, while comparatively high pressure and moderate winds prevailed over the greater part of the steamer lanes, although a few reports of moderate gales were received from vessels in both the eastern and western sections. By the 28th the storm area had practically disappeared and fine weather prevailed generally.

On the 29th and 30th there was a disturbance near 47° N., 25° W., and on the latter date moderate to strong northwesterly gales occurred over a limited area in the southwesterly quadrants.

OCEAN GALES AND STORMS, APRIL, 1926

Vessel	Voyage		Position at time of lowest barometer		Gale began	Time of lowest barometer	Gale ended	Lowest barometer	Direction of wind when gale began	Direction and force of wind at time of lowest barometer	Direction of wind when gale ended	Highest force of wind and direction	Shifts of wind near time of lowest barometer
	From—	To—	Latitude	Longitude									
NORTH ATLANTIC OCEAN			° ′	° ′				*Inches*					
Moorish Prince, Br. S. S.	Oran	New York	37 48 N.	59 30 W.	Apr. 1	8a., 1st	2d	29.39	SW	—, 7	NW	—, 10	SW.-NW.
Can. Leader, Br. S. S.	Swansea	St. Johns	42 28 N.	47 43 W.	Mar. 30	2p., 1st	1st	29.11	NNW.	NNW., 7	NW	NW., 10	NNW.-NW.
Roma, Fr. S. S.	Providence	Lisbon	38 02 N.	33 08 W.	28th	—, 1st	1st	29.12	W	NNW., —	NNW	—, 11	W.-SW.
Hessen, Ger. S. S.	Antwerp	Cristobal	41 23 N.	20 13 W.	Apr. 1	6 p., 1st	2d	29.09	SSE	SSE., 10	SW	SSE., 10	SSE.-SW.
River Orontes, Br. S. S.	do	Philadelphia	41 00 N.	60 00 W.	1st	4 a., 2d	2d	29.24	W	W., —	NNW	—, 10	W.-NW.
Sinaia, Fr. S. S.	Lisbon	Providence	38 20 N.	55 00 W.	1st	1 a., 2	3d	29.14	SW	W., 10	N	W., 11	SSW.-W.-N.
Mount Evans, Am. S. S.	Galveston	Liverpool	49 20 N.	25 54 W.	2d	8 a., 2d	3d	28.64	W	ESE., —	S	W., 10	ESE.-WSW.
E. R. Kemp, Am. S. S.	Houston	Ghent	41 30 N.	42 52 W.	2d	Midt. 3d	4th	28.84	WNW.	—, 7	NNW	—, 9	SW.-NW.
F. H. Hillman, Am. S. S.	London	Balboa	32 22 N.	36 19 W.	4th	10 p., 4th	4th	29.52	WSW.	W., 9	WNW.	—, 10	W.-NW.
Jeff Davis, Am. S. S.	Hull	Jacksonville	32 35 N.	55 10 W.	5th	4 a., 5th	5th	29.58	SW	NW., 8	NW	NW., 9	SW.-W.-NW.
Brush, Am. S. S.	Dunkirk	Houston	41 42 N.	25 49 W.	3rd	4 a., 5th	5th	29.18	SSW.	SSE., 10	SW	SSE., 10	S.-SSE.-SW.
Roanoke, Am. S. S.	Port Arthur	Norfolk	28 01 N.	90 35 W.	6th	2 p., 6th	6th	29.76	SE	SE., 7	SE	NE., 9	SE.-NE.
Western Plains, Am. S. S.	Antwerp	New York	41 50 N.	37 37 W.	6th	Noon 6th	7th	29.51	SW	SW., 6	NW	—, 10	SW.-NW.
Narragansett, Br. M. S.	London	Philadelphia	49 33 N.	18 55 W.	5th	2 a., 6th	6th	29.22	SSE	SSW., 9	NW	SSW., 9	SSW.-WSW.
Suriname, Am. S. S.	Barrios	New Orleans	27 00 N.	88 25 W.	6th	6 a., 7th	7th	29.72	N	N., 8	NE	N., 8	N.-SE.
M. F. Elliott, Am. S. S.	New York	Texas City	26 00 N.	79 20 W.	8th	3 a., 8th	8th	29.90	SE	S., 10	S	S., 12	S.-SSW.
Western Plains, Am. S. S.	Antwerp	New York	41 20 N.	64 10 W.	8th	4 p., 8th	9th	29.36	SW	SW., 8	W	—, 10	SW.-W.
Tomalva, Am. S. S.	New York	Rotterdam	40 09 N.	63 28 W.	9th	6 a., 9th	9th	29.66	SW	SW., 10	SSW	SW., 10	SW.-SSW.
Wellfield, Br. S. S.	Scotland	Key West	47 16 N.	39 56 W.	7th	11 p., 9th	10th	29.24	SW	WNW., 9	NW	WNW., 9	W.-NW.
Euryades, Br. S. S.	Algiers	Boston	38 33 N.	57 07 W.	9th	7 a., 10th	10th	29.80	SW	SW., 5	WNW	SW., 9	SW.-WNW.
Dront, Br. S. S.	Alexandria	Hull	40 30 N.	9 34 W.	10th	4 a., 11th	11th	29.44	SW	WSW., 9	WNW	—, 9	WSW.-WNW.
Boston City, Br. S. S.	Bristol	Philadelphia	43 00 N.	46 00 W.	11th	Midt. 11th	12th	29.54	SW	SW., 9	NNW	—, 9	SW.-WNW.
Republic, Am. S. S.	Cob	New York	47 38 N.	21 05 W.	11th	8 p., 12th	14th	29.29	W	S., 11	W	S., 11	W.-SW.
Oscar II, Dan. S. S.	Oslo	Halifax	46 40 N.	23 30 W.	13th	Noon 13th	14th	28.85	SSE	SSE., 9	WSW	SSE., 10	SSE.-S.-SSW.
Steel Traveler, Am. S. S.	Gibraltar	New York	38 45 N.	59 27 W.	15th	6 a., 15th	15th	29.45	SW	SW., —	W	—, 10	SSW.-WSW.
Malabar, Am. S. S.	New York	South Pass	29 50 N.	77 32 W.	16th	10 a., 16th	16th	29.76	W	W., 8	WNW	W., 8	W.-WNW.
Shickshinny, Am. S. S.	Antwerp	Jacksonville	49 29 N.	4 42 W.	16th	8 a., 16th	17th	29.49	WSW.	WNW., 8	WNW	NW., 8	
West Chatala, Am. S. S.	Spain	New Orleans	44 59 N.	4 18 W.	17th	18th	19th	29.66	W	WSW., 8	NNW	W., 8	W.-NNW.
Slavic Prince, Br. S. S.	Penang	New York	38 43 N.	68 46 W.	20th	2 a., 20th	20th	29.62		N., —	NNE	—, 9	N.-NNE.
New York City, Br. S. S.	Cardiff	Philadelphia	49 50 N.	22 30 W.	20th	1 a., 20th	20th	29.84	W	W., 8	NW	W., 9	Steady.
Columbus, Ger. S. S.	New York	Bremerhaven	40 18 N.	60 55 W.	20th	Noon, 21st	21st	29.63	WNW.	W., 9	WSW	—, 9	WNW.-WSW.
Providence, Fr. S. S.	Palermo	New York	39 10 N.	65 50 W.	25th	10 p., 25th	25th	29.88	SSW	SSW., 9	SW	SSW., 9	SSW.-SW.
Magmeric, Am. S. S.	Antwerp	Jacksonville	51 18 N.	2 09 E.	25th	—, 25th	26th	29.60	NE	NE., 9	NW	—, 9	NE.-NW.
Illinois, Am. S. S.	Port Arthur	Stockholm	47 41 N.	22 19 W.	26th	10 a., 26th	27th	29.83	NE	—, 6	NE	N., 8	Steady.
New York City, Br S. S.	Cardiff	Philadelphia	41 33 N.	58 10 W.	27th	4 a., 27th	27th	29.60	SSW	SSW., 9	NW	SSW., 9	SSW.-NW.
Endicott, Am. S. S.	Antwerp	Galveston	43 25 N.	23 45 W.	30th	4 p., 30th	May 2	29.40	WNW.	WNW., 8	NW	NW., 9	WNW.-NW.
NORTH PACIFIC OCEAN													
Hakodate Maru, Jap. S. S.	Yokohama	San Francisco.	46 25 N.	177 10 E.	Mar. 31	4a., Apr. 1	Apr. 1.	29.37	S	S., 8	S	SE., 10	
Frank G. Drum, Am. S. S.	San Francisco.	Honolulu	26 52 N.	148 19 W.	Apr. 1.	4 p., 1st	3d	29.73	NW	NW., 3	NNW.	NW., 8	SW.-NW.
Java Arrow, Am. S. S.	do	Osaka	33 25 N.	150 17 E.	3d	Noon, 4th	4th	29.62	S	SW., 6	N	S., 8	SSW.-W.-NW.
Maui, Am. S. S.	do	Honolulu	27 10 N.	148 27 W.	3d	8 p., 3d	4th	29.42	NW	W., 5	NW	NW., 8	SW.-W.
Lubrico, Am. S. S.	San Pedro	San Juan	33 20 N.	120 20 W.	4th	12 a., 5th	5th	29.72	SE	SSW., 4	ESE	SE., 8	4 pts.
Dewey, Am. S. S.	Portland	Yokohama	45 38 N.	160 21 E.	4th	12 p., 4th	5th	28.47	E	N., 8	WNW	NW., 10	N.-NW.
St. Mihiel, Am. S. S.	San Francisco.	Honolulu	31 N.	137 40 W.	4th	Midt., 4th	5th	29.39	W	W., 8	NW	NW., 9	SW.-NW.
Wheatland Montana, Am. S. S.	Everett	Orient	47 03 N.	170 45 E.	4th	11 p., 5th	6th	28.86	E	S., 8	SW	SW., 12	8 pts.
Maunalei, Am. S. S.	San Francisco.	Honolulu	29 34 N.	141 30 W.	4th	6 a., 6th	6th	29.39	NW	WNW., —	NW	WNW., 9.	
Africa Maru, Jap. S. S.	Yokohama	Victoria	40 32 N.	151 17 E.	5th	—, 5th	6th		W	W., 9	W	W., 9	W.-NW.
Protesilaus, Br. S. S.	do	do	46 17 N.	166 54 E.	5th	10 a., 5th	7th	28.59	SSW	SW., 8	NW	WSW., 10.	SW.-WSW.
West Carmona, Am. S. S.	Hongkong	San Francisco.	38 50 N.	133 40 W.	6th	6 a., 7th	8th	29.05	NW	NW., 7	NW	WNW., 11	NW.-WNW.
Steel Engineer, Am. S. S.	San Pedro	Yokohama	41 06 N.	135 00 W.	6th	4 a., 7th	11th	28.99	ESE	NE., 7	NW	NNW., 10	E.-NE.-N.
Koyu Maru, Jap. S. S.	Grays Harb.	Osaka	47 15 N.	160 50 E.	11th	8 p., 11th	12th	29.18	SSE	SSE., 7	S	SW., 9	SSE.-SW.-S.
Emp. of Russia, Br. S. S.	Yokohama	Vancouver	45 46 N.	164 04 E.	13th	3 p., 13th	14th	29.00	SE	SE., 7	SW	SW., 8	SE.-SW.
Wheatland Montana, Am. S. S.	Everett	Orient	50 12 N.	156 22 W.	13th	2 a., 14th	15th	28.84	SSE	S., 5	SW	WSW., 10.	6 pts.
Elkton, Am. S. S.	Honolulu	Kobe	30 42 N.	135 26 E.	15th	7 p., 15th	16th	29.72	W	W., 7	N	NW., 9	W.-N.
Steel Engineer, Am. S. S.	San Pedro	Yokohama	44 38 N.	170 17 W.	13th	4 a., 16th	18th	29.02	SSW.	W., 8	WNW	WNW., 9.	W.-WNW.
Pres. Taft, Am. S. S.	San Francisco.	do	33 46 N.	164 20 E.	15th	10 a., 16th	17th	29.52	SW	WSW., 6	NW	WSW., 10.	W.-WSW.
Makena, Am. S. S.	Puget Sound	Honolulu	41 18 N.	137 10 W.	15th	8 a., 16th	18th	29.56	SW	SSW., 6	W	NNW., 8	NW.-N.
West Chopaka, Am. S. S.	Manila	San Francisco	45 27 N.	165 46 W.	15th	—, 17th	19th	28.96	SE	SW., 7	WSW	W., 10	S.-SW.-W.
Kongosan Maru, Jap. S. S.	Miike	Vancouver	51 12 N.	141 34 W.	17th	Noon, 17th	18th	29.22	S	SE., 8	S	SE., 9	S.-SE.-S.
Java Arrow, Am. S. S.	Tsurumi	San Pedro	38 23 N.	147 20 E.	19th	7 a., 19th	21st	29.14	NW	NW., 6	W	NW., 9	SSE.-NW.
Elkton, Am. S. S.	Honolulu	Kobe	32 06 N.	142 28 E.	19th	3 a., 19th	21st	29.50	WSW.	NW., 8	NW	SW., 10	WSW.-NW.-W.
Bradford City, Br. S. S.	Muroran	Vancouver	49 20 N.	158 W.	21st	4 a., 22d	22d	29.07	N	N., —	SE	N., 9	N.-S.-SE.
Oakridge, Am. S. S.	Portland	Yokohama	52 06 N.	150 03 W.	22d	2 a., 23d	23d	29.47	ENE.	E., 6	E	ENE., 8	ENE.-E.
Korea Maru, Jap S. S.	Yokohama	San Francisco.	40 N.	164 40 E.	24th	10 a	24th	29.26	SW	SW., 7	W	SW., 9	
Pawlet, Am. S. S.	Hongkong	San Pedro	39 50 N.	160 20 E.	25th	2 p., 26th	26th	29.42	ESE	ESE., 7	SE	E., 9	E.-SE.-ESE.
Steel Engineer, Am. S. S.	San Pedro	Yokohama	35 53 N.	144 14 E.	29th	6 a., 29th	30th	29.37	SE	SW., 8	NNW	N., 9	SE.-SW.-NNW.
Philoctetes, Br. S. S.	Yokohama	Victoria	39 28 N.	147 56 E.	29th	5 a., 30th	May 1.	29.09	NE	NNW., 10.	NW	NNW., 10.	N.-NNW-NW.
West Himrod, Am. S. S.	do	Seattle	44 56 N.	161 31 E.	28th	8 p., 30th	1st	28.94	E	E., 7	NNE.	ENE., 9.	E.-ENE.-NE.

NORTH PACIFIC OCEAN

By WILLIS EDWIN HURD

The Aleutian LOW, as in March, was centered over the archipelago southwest of Alaska. The pressure over the region had risen greatly, but remained much below the normal. Along the American coast east of the 140th meridian it diminished somewhat. In consequence of these two pressure changes, the intensity of the gradient noted for the previous month between Dutch Harbor and Juneau had now given place to a more usual condition. The anticyclone, normally central northeast of Hawaii, now extended in an elongated formation from the coast of California to the low latitudes west of the 180th meridian, with the crest overlying Midway Island. During the first decade of April the eastern part of the area occupied by this average HIGH was dominated by a cyclone, but after the latter's disappearance, the HIGH resumed its position, and continued there until the end of the month. The Asiatic HIGH showed distinct signs of weakening, and during more than half of the month pressure was low along the China coast.

The table herewith shows pressure values at several island and coast stations:

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure at sea level at indicated hours, North Pacific Ocean, April, 1926*

Station	Average pressure	Departure from normal	Highest	Date	Lowest	Date
	Inches	*Inch*	*Inches*		*Inches*	
Dutch Harbor [1]	29.50	−0.33	30.16	1st	28.86	17th.
St. Paul [1]	29.74	−0.06	30.26	2d	29.22	17th.
Kodiak [1]	29.63	−0.17	30.26	1st	28.88	18th.
Midway Island [1]	30.13	+0.03	30.28	3d	29.82	9th.
Honolulu [2]	30.06	0.00	30.15	5th	29.84	1st.
Juneau [2]	29.88	−0.08	30.32	23d	29.45	8th.
Tatoosh Island [2 3]	29.98	−0.06	30.47	23d	29.36	7th.
San Francisco [2 3]	29.96	−0.08	30.22	19th	29.44	7th.
San Diego [2 3]	29.96	0.00	30.09	19th	29.74	5th.

[1] P. m. observations only.
[2] A. m. and p. m. observations.
[3] Corrected to 24-hour mean.

The disturbance which lay over the California-Hawaiian routes from the 1st to the 8th was meteorologically the most important development during April. This cyclone, which originated on the 26th of March, northeast of Hawaii as a secondary to the Aleutian LOW dwindled, and lay dormant somewhat south of its point of origin until April 3, when it acquired new energy, and on that day caused moderate northwest gales 200 miles or so northeast of Hawaii. On the 4th to 7th gales of force 8 to 10 were more or less widespread over all but the extreme eastern and western portions of the area between the islands and the coast, and on the 8th the coast region was stormy as the LOW entered the continent. The highest wind of the period was a west-northwest gale of force 11 which blew from 2 p. m. until midnight of the 7th near 39° N., 134° W. Extraordinarily heavy rains over central and southern California accompanied this disturbance. At San Diego the precipitation was the greatest on record for April.

On the 16th and 17th another secondary of the Aleutian cyclone formed off the Washington and Oregon coasts. Pressures fell only moderately, but during the forenoon of the 17th hurricane squalls were experienced near 39° N., 139° W. Other occurrences of moderate to strong winds were reported in west longitudes on several days and are noted in the table of gales.

West of the 180th meridian gales occurred along the routes north of the 30th parallel on at least 19 days. Of the several storms, some of which entered the ocean by way of Japan, that of the 4th to the 6th in higher latitudes was the severest. The American steamer *Wheatland Montana* was the most heavily involved in this cyclone, experiencing a whole SE. gale on the night of the 4th–5th, near 47° N., 170° E., and a SW. hurricane 24 hours later, near 47° N., 172° E., lowest pressure 28.86 inches. The storm was accompanied by squalls of sleet and snow, interspersed with banks of passing fog. Rain, hail, snow, and sleet occurred in connection with stormy conditions west of midocean until the end of the month.

No gales thus far have been reported for April from the tropics.

At Honolulu the prevailing wind was northeast, the first change from east in many months. The maximum velocity was 29 miles from the east, on the 13th. Precipitation was slight, totaling 0.74 inch, of which 0.64 fell during a kona on the 11th. Thus, as noted by the observer, "unprecedented drouth continued."

No snow fell at Juneau during the month, which is unusual. Along the California coast abnormally warm weather prevailed, San Francisco and San Diego reporting the highest average April temperatures of record.

Fog showed a general and considerable increase over that of March, especially in the region between 165° east longitude and Japan. It was observed on several days off the China coast, and off most of the American coast south of the 52d parallel. On the 2d it occurred west of Costa Rica, and on the 10th in the Bay of Panama. On the 4th and 5th dense fog was encountered less than a degree south of the Equator near 90° west longitude.

DETAILS OF THE WEATHER IN THE UNITED STATES

GENERAL CONDITIONS

The single outstanding feature of the month's weather was the pronounced depression of the barometer over the northeast Pacific. In the region usually occupied by the statistical anticyclone of the eastern Pacific mean pressure was but 30.01 inches. Probably as a direct result of this disturbance of the normal pressure distribution over the Pacific, and incidentally over the western fringe of the United States, unprecedented rains for April fell in southern California and also in the Great Valley as far north as Red Bluff.

The month was exceptionally warm west of the Rocky Mountains and cool to the eastward (see Chart III of this REVIEW).

Precipitation was generally deficient as shown by the inset on Chart IV.

CYCLONES AND ANTICYCLONES

By W. P. DAY

Seventeen well-defined disturbances were charted during April, but only one or possibly two were important as storms. Ten of these LOWS were of the Alberta type, often dipping down over the Lake region as they moved eastward.

Eight of the 10 HIGHS plotted were of the Alberta or Canadian interior type. These caused frequent alternations in temperature, and considerable cool weather over eastern and southern sections, but individually the HIGHS were of only slight or moderate proportions, and with the exception of the HIGH central over Kentucky on the morning of the 20th, did not produce any unusually low temperatures.

FREE-AIR SUMMARY

By V. E. JAKL

The average free-air temperatures at aerological stations for which normals are available (see Table 1) show departures corresponding to those at the surface, as shown on Chart III, this REVIEW. At Royal Center the departure was greatest, and negative; Ellendale, where the temperature was moderately above normal, was the only station showing a positive departure. At all stations the departure diminished somewhat with altitude. Relative humidity was about normal, except over Ellendale, where it was decidedly below normal.

TABLE 1.—*Free-air temperatures, relative humidities, and vapor pressures during April, 1926*

TEMPERATURE (°C.)

Altitude, m. s. l.	Broken Arrow, Okla. (233 meters)		Due West S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Groesbeck, Tex. (141 meters)		Royal Center, Ind. (225 meters)		*Washington, D. C. (7 meters) mean
	Mean	Departure from 8-year mean	Mean	Departure from 6-year mean	Mean	Departure from 9-year mean	Mean	Departure from 8-year mean	Mean	Departure from 8-year mean	
Meters											
Surface	12.5	−2.9	15.9	−1.3	7.4	+1.4	14.8	−3.3	5.7	−4.9	8.9
250	12.4	−2.9	15.6	−1.3			14.1	−3.3	5.4	−5.0	7.6
500	10.8	−2.9	13.5	−1.2	7.0	+1.3	12.7	−3.1	3.2	−4.9	6.3
750	9.6	−2.7	12.1	−0.9	5.6	+1.3	12.3	−2.5	2.1	−4.7	5.1
1,000	8.7	−2.6	11.0	−0.7	4.2	+1.0	12.1	−1.9	1.6	−4.0	4.1
1,250	8.0	−2.2	9.5	−0.9	2.7	+0.7	11.5	−1.7	0.7	−3.7	3.2
1,500	7.4	−1.7	8.0	−1.0	1.5	+0.7	10.8	−1.7	−0.2	−3.5	1.8
2,000	6.0	−0.7	5.1	−0.9	−1.6	+0.2	8.5	−1.9	−1.7	−2.7	−0.3
2,500	3.5	−0.3	2.0	−1.4	−3.9	+0.7	6.0	−1.7	−4.1	−2.5	−2.1
3,000	0.8	+0.1	−0.8	−1.6	−6.7	+0.8	3.2	−1.7	−6.6	−2.4	−4.3
3,500	−2.0	+0.4	−3.3	−1.5	−9.9	+0.6	0.0	−2.1	−8.8	−2.1	−6.9
4,000	−4.9	+0.5	−6.2	−2.0	−13.0	+0.7			−11.0	−2.1	−9.6
4,500	−7.8	+0.5			−15.6	+1.0			−13.2	−1.7	−13.0
5,000	−10.1	+1.0									

RELATIVE HUMIDITY (%)

Surface	63	−1	57	−3	47	−18	77	+5	66	+2	70
250	63	−1	57	−3			76	+4	66	+2	69
500	63	0	57	−4	47	−17	74	+4	62	+1	66
750	62	0	57	−4	46	−16	70	+3	63	+1	64
1,000	62	+2	57	−4	46	−15	63	+1	63	+2	63
1,250	58	0	55	−6	48	−12	57	0	63	+3	64
1,500	56	0	52	−8	48	−11	51	0	61	+2	66
2,000	51	−1	49	−10	50	−7	50	+4	56	−1	66
2,500	48	−3	52	−3	47	−11	51	+6	53	−2	65
3,000	49	−2	53	+2	49	−9	52	+8	48	−5	63
3,500	46	−6	53	+6	53	−6	38	−8	48	−5	65
4,000	46	−4	49	+3	56	−4			49	−2	62
4,500	47	−4			47	−11			48	−3	58
5,000	47	−6									

VAPOR PRESSURE (*mb.*)

Surface	9.10	−2.48	10.16	−1.82	4.45	−1.48	13.15	−2.06	6.14	−2.42	8.50
250	9.03	−2.45	10.08	−1.71			12.46	−2.04	6.07	−2.35	7.68
500	8.02	−2.16	8.84	−1.64	4.35	−1.42	11.08	−1.73	5.18	−2.07	6.74
750	7.24	−1.86	8.04	−1.48	3.89	−1.22	10.13	−1.32	4.66	−1.85	6.06
1,000	6.94	−1.29	7.58	−1.17	3.59	−1.05	8.95	−1.06	4.45	−1.45	5.56
1,250	6.31	−1.08	6.73	−1.19	3.36	−0.87	7.61	−1.01	4.24	−1.10	5.32
1,500	5.90	−0.77	5.73	−1.36	3.15	−0.66	6.41	−0.84	3.79	−1.07	4.99
2,000	4.76	−0.47	4.34	−1.19	2.76	−0.26	5.53	−0.03	3.02	−1.01	4.28
2,500	3.71	−0.45	3.67	−0.45	2.36	−0.08	4.83	+0.31	2.20	−0.97	3.61
3,000	3.12	−0.27	2.93	−0.08	1.97	+0.02	4.18	+0.48	1.70	−0.82	2.87
3,500	2.50	−0.30	2.51	+0.16	1.62	+0.03	2.40	−0.76	1.37	−0.77	2.37
4,000	2.14	−0.06	1.92	+0.07	1.19	−0.05			1.16	−0.67	1.77
4,500	1.82	−0.07			0.63	−0.26			0.93	−0.58	1.34
5,000	1.58	−0.07									

* Naval air station.

The departure of resultant winds from normal was not of much importance at most stations. (See Table 2.) There was, however, a tendency for a little more northerly component or less southerly component at those stations where the temperature was below normal. This was especially evident over Royal Center, where in the lower levels the resultant winds were northwesterly (normal, southwesterly), while with increasing altitude the resultant direction (corresponding with the decrease in negative temperature departure) became more nearly the normal westerly direction.

Well-defined periods of east component free-air winds prevailing over extended areas were absent, except on the 10th–13th up to 4,000 to 7,000 meters at Denver, Drexel, and Royal Center, and on the 15th above about 5,000 meters at Broken Arrow, Denver, and Drexel. In the former period the wind directions in the high altitudes conformed to the sea-level pressure situation at the stations concerned, i. e., the gradient was north-south; on the 15th however, the easterly winds aloft can be accounted for only by a reversal of pressure gradient with height. The records at Ellendale and Groesbeck indeed show a tendency to higher free-air temperatures over the former station than over the latter. The highest wind velocity recorded was 46 m. p. s. (over 100 m. p. h.) from the west at 7,700 meters over Ellendale on the 8th. The surface map showed a weak pressure gradient over Ellendale within an extensive moderate HIGH.

An example of rapid increase in velocity with altitude, followed by an almost as rapid decrease, is shown by the records of both kite and two-theodolite pilot-balloon observations at Ellendale on the morning of the 19th. The pilot-balloon observation shows an increase from 5 m. p. s. at the ground to 23 m. p. s. at 400 meters, thence a decrease to 6 m. p. s. at 1,600 meters. This was associated, as usual, with an inversion in temperature at the altitude of highest wind velocity, in the southwesterly wind in the rear of a HIGH. In distinction to this, the afternoon pilot balloon observation at Royal Center on the 24th showed a strong lapse rate in temperature and strong wind in the lower levels where only friction and turbulence determine the increase in wind velocity with altitude, the increase in velocity being from 20 meters per second southwest on the ground to 36 meters per second west-southwest at 1,000 meters. An intense LOW was centered not far to the north. In the case at Ellendale on the 19th the rate of increase in velocity with altitude was more than six times that at Royal Center on the 24th.

The kite observation at Ellendale on the 29th is a good example of a lapse rate approximating the dry adiabatic, with a regular increase in relative humidity extending to 4,340 meters, where A–Cu. clouds prevailed. The effect of convection up to that height is shown by the two theodolite pilot balloon observation, taken almost simultaneously, in front of a LOW moving rapidly from the northwest but which caused no precipitation at Ellendale. This case simply emphasizes what has been previously referred to in the free-air summaries, viz, that over interior regions a high lapse rate of itself does not necessarily favor precipitation. The free-air data for this observation are given in the following table:

Altitude m. s. l.	Temperature	Δ t 100 m	Relative humidity	Wind	
				Direction	Velocity
Meters	*° C.*		*Per cent*		*M. p. s.*
Surface 444	29.8		17	WNW	7.6
964	23.6	1.48	18	W	8.6
1,759	14.4	.92	25	W	11.1
2,885	2.9	1.02	44	W	10.8
4,340	−10.0	.89	100	WNW	15.2
4,827	−12.3	.47	84	WNW	16.0

NOTE: Beginning with this number of the REVIEW the data for Washington, D. C., will be printed in Tables 1 and 2, in the space made available by the discontinuance of the Drexel station. The Washington data in Table 1 are taken from the Naval Air Station airplane observations, and in Table 2 from the pilot-balloon observations at the Weather Bureau.

TABLE 2.—*Free-air resultant winds (m. p. s.) during April, 1926*

Altitude, m. s. l.	Broken Arrow, Okla. (233 meters)				Due West, S. C. (217 meters)				Ellendale, N. Dak. (444 meters)				Groesbeck, Tex. (141 meters)				Royal Center, Ind. (225 meters)				Washington, D. C. (34 meters)	
	Mean		8-year mean		Mean		6-year mean		Mean		9-year mean		Mean		8-year mean		Mean		8-year mean		Mean	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Meters																						
Surface	N. 55°W.	0.9	S. 5°W.	2.4	S. 72°W.	2.9	S. 79°W.	1.6	N. 76°W.	2.1	N. 18°W.	1.6	N. 62°W.	0.4	S. 3°E.	2.2	N. 66°W.	2.5	S. 54°W.	1.9	N. 25°W.	1.6
250	N. 61°W.	0.9	S. 5°W.	2.5	S. 73°W.	3.1	S. 77°W.	1.8	.....	.....	.....	.....	S. 62°W.	0.3	S. 4°E.	2.9	N. 70°W.	2.7	S. 53°W.	2.0	N. 70°W.	2.9
500	S. 59°W.	1.3	S. 11°W.	3.9	S. 74°W.	4.7	S. 75°W.	2.7	N. 52°W.	3.6	N. 18°W.	1.6	S. 10°E.	1.4	S. 3°E.	4.4	N. 66°W.	5.0	S. 53°W.	3.8	N. 81°W.	4.7
750	S. 71°W.	1.9	S. 16°W.	4.7	S. 73°W.	5.3	S. 69°W.	3.4	N. 48°W.	4.2	N. 31°W.	1.2	S. 13°W.	2.2	S. 12°W.	5.0	N. 60°W.	6.2	S. 59°W.	4.8	N. 76°W.	6.8
1,000	S. 82°W.	3.0	S. 28°W.	5.2	S. 73°W.	6.3	S. 65°W.	4.1	N. 52°W.	4.4	N. 54°W.	1.4	S. 12°W.	2.4	S. 21°W.	5.2	N. 56°W.	7.3	S. 64°W.	5.5	N. 82°W.	9.9
1,250	S. 80°W.	3.3	S. 40°W.	5.4	S. 73°W.	8.6	S. 69°W.	5.7	N. 54°W.	4.8	N. 60°W.	2.2	S. 21°W.	2.8	S. 31°W.	6.1	N. 59°W.	8.9	S. 75°W.	6.5	.....	.....
1,500	S. 83°W.	3.7	S. 52°W.	6.0	S. 77°W.	10.1	S. 71°W.	6.9	N. 57°W.	5.4	N. 63°W.	2.7	S. 39°W.	3.3	S. 37°W.	6.7	N. 63°W.	10.1	S. 83°W.	7.3	N. 78°W.	10.0
2,000	N. 72°W.	5.5	S. 65°W.	7.1	S. 76°W.	10.9	S. 80°W.	8.3	N. 55°W.	7.3	N. 73°W.	3.5	S. 67°W.	5.2	S. 40°W.	7.7	N. 65°W.	12.0	S. 89°W.	8.5	N. 78°W.	11.6
2,500	N. 78°W.	6.0	S. 72°W.	7.9	S. 74°W.	11.1	S. 80°W.	10.0	N. 56°W.	9.8	N. 79°W.	5.1	S. 64°W.	5.8	S. 59°W.	8.3	N. 74°W.	14.0	N. 85°W.	9.0	N. 81°W.	14.2
3,000	N. 72°W.	5.3	S. 82°W.	7.8	S. 74°W.	13.7	S. 81°W.	10.7	N. 58°W.	11.6	N. 77°W.	6.8	N. 84°W.	4.3	S. 65°W.	10.1	N. 68°W.	11.6	N. 83°W.	10.0	S. 89°W.	15.2
3,500	N. 64°W.	6.3	S. 87°W.	10.0	S. 81°W.	10.5	N. 86°W.	11.5	N. 54°W.	12.2	N. 78°W.	8.2	S. 60°W.	5.2	S. 70°W.	10.1	N. 71°W.	15.8	S. 89°W.	11.8	N. 85°W.	12.8
4,000	N. 81°W.	6.3	S. 84°W.	11.4	S. 64°W.	9.2	N. 82°W.	12.8	N. 49°W.	13.8	N. 71°W.	9.6	.....	.....	.....	.....	N. 62°W.	20.2	N. 84°W.	14.6	N. 69°W.	13.2
4,500	N. 78°W.	8.3	S. 86°W.	12.2	S. 75°W.	12.2	N. 63°W.	13.2	N. 50°W.	12.8	N. 60°W.	9.6	.....	.....	.....	.....	N. 62°W.	22.3	N. 76°W.	14.7	N. 76°W.	13.7
5,000	N. 65°W.	6.2	N. 81°W.	10.6	.....	.....	.....	.....	N. 68°W.	16.0	N. 73°W.	15.3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

THE WEATHER ELEMENTS

By P. C. DAY, in Charge of Division

PRESSURE AND WINDS

While the weather did not vary greatly at any particular time from that usually expected at intervals in April, still the long continuance of certain types of weather resulted in the establishment of unusual conditions for the month as a whole, particularly as to temperature and precipitation.

Variations in pressure were mainly moderate and there were few extensive or severe storm areas.

The most important cyclonic conditions were those which gave beneficial precipitation over the Pacific coast early in the month, mainly heavy rains about the 5th to 9th throughout California, particularly in the south, where most needed, greatly relieving a severe drought that had persisted since near the middle of February, and affording a long-delayed opportunity for replenishing alarmingly low-water supplies. Precipitation during this period was in many instances the greatest ever recorded in April, and removed all danger to crops from a water shortage. The rain area extended into other portions of the Southwest, giving frequent precipitation in Arizona and portions of surrounding States, where locally the monthly falls were equal to or even greater than occasionally occur in an entire year.

Over most other southern districts precipitation was rather frequent during the first half of the month, due to the passage over those districts of cyclonic areas usually of only moderate strength. During the latter half there was little precipitation over those districts, and over most central and northern sections of the country storm activity throughout the month was unimportant.

The principal cyclones aside from those mentioned were those of the 1st to 3d and 24th to 25th. During the 1st to 3d a low-pressure area moved from the southern Plains northeastward to the Lower Lakes, attended by some unusually heavy snows over the northern side of the storm track, particularly in a narrow area from the southern Rocky Mountains northeastward through northern Kansas to southern Lake Michigan. Locally the depths ranged up to 10 inches or more and with considerable depths remaining from the heavy falls over practically the same area late in March, conditions approached those associated with a severe winter storm.

The storm of the 24th and 25th moved from the middle Mississippi Valley to the Great Lakes, where on the morning of the 24th the pressure had fallen to only slightly above 29 inches, and precipitation had covered a wide area of the central valleys extending from the Gulf of Mexico to the Canadian border. During the following 24 hours the storm center advanced to western Ontario, but precipitation was confined mainly to the northern districts from the Great Lakes and Ohio Valley eastward. During the last few days several unimportant cyclones moved over the Great Lakes and thence northeastward, but the accompanying precipitation was light and confined to rather small areas.

Mild anticyclonic conditions persisted over the interior during much of the month, particularly over the Missouri Valley, though during the latter part high pressure was rather persistent over the Gulf States.

The average pressure was highest from the upper Missouri Valley southeastward to the Florida Peninsula, and lowest over the Canadian Maritime Provinces, being generally considerably above normal in the first-mentioned area and also somewhat above over adjacent areas on the east and west, becoming below normal over the Atlantic coast States from the Carolinas northward and over the eastern Canadian Provinces and along the Pacific coast.

Generally the average pressure for April is distinctly less than that for March in all districts save in the far Northwest and extreme Northeast.

For April, 1926, the average was nearly everywhere less, markedly so from the Missouri Valley westward and over western Canada; also, though to a less degree, over eastern Canada, where it is usually higher.

The prevailing winds were mainly from west to northwest from the Mississippi Valley eastward, southerly over Texas and some near-by areas, and generally northerly in the Missouri Valley and far Northwest.

The severe wind and other storms occurred locally at widely separated dates and places.

The greatest damage by electrical storms occurred near San Luis Obispo, Calif., and near Los Angeles, on the 7th. A full account of the former is printed elsewhere in this number of the REVIEW.

About the 23d and 24th rather numerous local storms of varying severity occurred from Texas northeastward to the Great Lakes in connection with the cyclone moving over that area. Several tornadoes were reported, mostly from Texas and Oklahoma, but without great loss of life or damage to property.

About the 27th high winds in Iowa and adjacent areas resulted in some of the worst dust storms ever known there. Much damage resulted from drifting soil filling roadways, uncovering seeds and the roots of growing crops in some sections and entirely covering vegetation in others.

Details concerning the more important storms appear at the end of this section and elsewhere in this issue.

TEMPERATURE

Important day-to-day changes in temperature were confined mainly to small areas, and rarely exceeded 20° in 24 hours, though in a few instances at the end of April there were some sharp falls, notably in the vicinity of southern Lake Michigan, where a fall of 35° in one hour occurred.

As in March, temperatures were below normal from the Southern Plains northeastward to the Great Lakes and to the eastward and above normal to the westward. In fact over much of the two divisions referred to temperatures continued similar throughout the two months.

Over much of the territory east of the Mississippi River the weather was decidedly cool during most of April, some sections having temperatures below normal, or only slightly above, nearly every day. As a result the average temperatures were in many cases the lowest of record or at least the lowest save April, 1907, when records for low monthly means over much of this area were established.

While new records for continued low temperatures were being made in much of the eastern third of the country high temperatures were the rule in the area from the Rocky Mountains westward, where the month was even more continuously warm than it was cold in the East. Over portions of the Plateau region and over much of the Pacific coast region every day was normal or above, the monthly means at many points being the highest ever known in April. Similar conditions had existed during the two preceding months and in some of the northern portions of the area since the beginning of the year.

The warmest periods were mainly during the last decade, and chiefly during the last day or two in the Ohio and upper Mississippi Valleys and the far Northwest. In the Pacific Coast States the maxima during this decade, particularly on the last two days, were frequently the highest of record for April. In portions of Texas and the middle Gulf States the 5th and 10th were the warmest days.

The lowest temperatures were observed on the 1st or 2d over nearly all districts from the Mississippi River westward and generally in the Gulf and South Atlantic States, frequently on the 4th and 5th in the Great Lakes region and Ohio Valley, on the 12th over the Northeastern States, and on the 19th and 20th in the southern Appalachian region, where in a few instances the minima on the 20th were the lowest ever reported so late in April.

Temperatures below freezing occurred at some point in every State except Florida, where 35° was the lowest observed. In the southern and coast districts of the South Atlantic and Gulf States and at the lower elevations in the Southwestern and Pacific Coast States large areas were without freezing temperatures.

PRECIPITATION

Precipitation, also, showed some sharp contrasts in different parts of the country, as compared with the normal for April and with the amounts recorded in the preceding month.

Precipitation was below normal over most of the country, the only portions having monthly totals above being a narrow area from northeastern Missouri over central Illinois and most of Indiana, and thence northeastward to the Lower Lakes and northern New England; over most of Florida; and generally from Texas westward to the Pacific, including the central portions of the Plateau region and practically all of California.

It was the driest April of record at many points in the Missouri Valley and the far Northwest, and decidedly dry in the central and northern portions of the middle and east Gulf States, the southern drainage of the Ohio River and generally over the Middle and South Atlantic States, where locally it was also the driest April of record.

On the other hand, the greater part of California had phenomenally heavy rains, in some cases more than six times the normal and decidedly the greatest ever reported in April. These heavy rains following an abnormally dry March were especially timely and beneficial.

Rainfall was heavy also over the greater part of Arizona and portions of adjacent States, including Colorado. In this area precipitation was well distributed through the month, fell in moderate amounts on numerous dates, and was largely absorbed in the soil. It was also unusually heavy in portions of southwest, north, and northwest Texas; portions of central and northern Florida had heavy rains during the first half, though drought conditions prevailed toward the end of the month.

SNOWFALL

The month opened with snow and typical winter conditions over a considerable area from the southern Rocky Mountains northeastward to the Great Lakes, due to an unusually heavy snowstorm at the end of March. This was augmented greatly during the first two or three days of April by additional snow over nearly the same area, still further delaying traffic over much of this territory, particularly in the vicinity of southern Lake Michigan, where railway operations were seriously delayed by deep drifts and many highways were closed for several days. Snowfall from this storm was the heaviest ever experienced in April over much of the area covered.

Over most of the country from the Great Lakes eastward snowfall was about normal, except that it was above in New England, nor was there material snowfall north of the area referred to previously as extending from the southern Rocky Mountains northeast to Lake Michigan.

In portions of northern New Mexico and southwestern Colorado snowfall for the month was large, reaching maximum depths of nearly 5 feet on some of the higher mountains.

On the high mountains of California probably less snow fell than frequently occurs in April, and this melted rapidly on account of the unusual warmth that prevailed

during much of the month. Over the northern mountain regions the snowfall appears to have been near normal.

At the end of April snow had practically disappeared, except in northern New England, where much of the ground was still covered, and in the high mountains of the West.

Due to continued cool weather, ice on the Great Lakes melted slowly and opening of navigation was delayed. At Buffalo the harbor was closed during the entire month, the ice fields being probably the heaviest for April in 50 years.

RELATIVE HUMIDITY

Despite the general coolness over the eastern two-thirds of the country, the relative humidity was mainly below average, due to the general lack of rain, while over the Southwest there was a general excess, despite the prevailing warmth, this due to the unusual rainy condition over that part of the country.

The deficiencies were large, 15 to 25 per cent, in the Missouri Valley, also to a less degree in the Appalachian Mountain region. In the far Southwest the excess was large, ranging from 10 to nearly 30 per cent.

SEVERE LOCAL HAIL AND WIND STORMS, APRIL, 1926

[The table herewith contains such data as have been received concerning severe local storms that occurred during the month. A more complete statement will appear in the Annual Report of the Chief of Bureau]

Place	Date	Time	Width of path, yards[1]	Loss of life	Value of property destroyed	Character of storm	Remarks	Authority
Raywood, Tex.	2	4:15 a. m.	4 mi.		$2,000	Hail	Character of damage not reported	Official, U. S. Weather Bureau.
At sea off La Jolla, Calif.	4–5			4		Gale	Small motor boat wrecked	Do.
San Diego County, Calif. (southwest part of).	5–6				300,000	Straight winds, rain, and 3 tornadoes.	Severe damage by flooding; many persons injured and buildings wrecked or damaged; trees and fruit badly injured. Greatest damage in vicinity of San Diego.	Do.
Crawford, Tex. (near)	6	5 p. m.	10		4,000–5,000	Tornado	Some damage to buildings; two persons injured	Do.
Laredo, Tex. (near)	6	5:30–6 p. m.			215,000	Hail	Approximately 1,300 acres of onions destroyed by hail which fell to a depth of 6 to 18 inches. Some damage to fruit and windows.	Do.
Brea Field, near Los Angeles, Calif.	7	A. m.			3,000,000–4,000,000	Electrical	Oil tanks fired	Do.
Red Bank, S. C.	7	6:15 p. m.			12,000	Small tornado	Property damaged over a path 6 miles long; two persons injured.	Do.
Center Point, Ark.	7	10 p. m.				Heavy hail	One orchard damaged considerably	Do
Edna, Calif. (near San Luis Obispo).	7–8			2	15,000,000	Three tornadoes and electrical.	Oil tanks fired by lightning; tornadoes evidently caused by heat from burning oil; other property damage.	Do
Fresno, Calif.	8					Hail	Slight damage to fruit trees in city	Do.
Odessa, Fla.	8	4 p. m.	10 mi.		5,000	Heavy hail	Considerable injury to crops; roofs and windows slightly damaged.	Do.
Brownwood, Tex.	9	P. m.				Tornadic wind	A number of buildings damaged	Dallas Morning News (Tex.)
Fort Worth, Tex.	9					Wind	Many plate glass windows broken; signs demolished; telephones out of order.	Do.
Mississippi coast	9–10				40,000	High winds	Small craft beached; several schooners sunk; poles blown down; power company suffers heaviest loss.	Times-Picayune (New Orleans, La.).
Southern Louisiana	10				900	do	Cabins and timber blown down, other buildings damaged; livestock killed. Telephone and electric service interrupted.	Official, U. S. Weather Bureau.
Davidson, Blount, Cocke, Jefferson, and Trousdale Counties, Tenn.	11–12					Hail	Window panes broken; early gardens, tobacco beds and fruit trees injured.	Do.
Brewster County, Tex. (southern part of).	14		4 mi.			do	No crops in this area; damage to grass slight. Path 35 miles long.	Do.
Uvalde, Tex. (near)	20	8:30–11 a.m.	1–8 mi.			Heavy hail	Large stones fell to depth of 12 inches in places; oats flattened, trees, windows and bushes damaged; poultry injured.	Do.
Sabinal, Tex. (near)	20	12–2 p. m.	1,760–2,640		10,000–20,000	Hail	Heavy loss to crops and honey industry	Do.
Boyce, La.	21			1		Tornadic wind	Considerable property damage; traffic delayed by debris.	Shreveport Times (La.).
Winnfield, La., and vicinity.	21					Wind and rain	Many shade trees and timber blown down; telephone and telegraph lines out of commission.	Do.
San Augustine, Tex. (15 miles southwest of).	21	8 p. m.				Tornado and straight wind.	Timber and buildings in path destroyed; other damage by straight wind over path 6 miles long.	Official, U. S. Weather Bureau.
Mobile, Ala.	22	6:27 a. m.				Squall	Shed unroofed and a few poles and fences blown down.	Do.
Cairo District, Ill.	22				100	Hail	Truck, hotbeds, and windows damaged	Do.
St. Joseph, La. (near)	23	3:30 p. m.	2,640		3,000	Wind	One residence, a barn, and two small buildings blown down; telephone lines damaged; path 12 miles long.	Do.
Southeastern Johnson and southwestern Atoka Counties, Okla.	23	4:27 – 5:30 p. m.		4	110,000	Tornado	Considerable property damage, crop loss small; nine persons injured.	Do.
Hiwassee, Ark.	23	5 p. m.	440		3,500	Small tornado	Character of damage not reported	Do.
Sallisaw (near), Okla., to Branch, Ark.	23	5 p. m.		1	10,000	Straight winds and tornado.	Considerable damage over path 52 miles long, most of which occurred in the vicinity of Fort Smith.	Do.
Weatherford, Tex.	23	5 p. m.	30			Tornado and hail.	Three farm houses completely destroyed; other damage by hail.	Do.
Keytesville, Mo.	23	P. m.			3,000	High wind	A few barns, poultry houses, and poles blown down.	Do.
Hannibal, Mo.	23	5–6 p. m.			12,000	Thunderstorm and wind.	Considerable property damage reported; one person injured; probably same storm that was felt at Keytesville.	Do.
Thorp Springs (near), Tex., to Granbury (near), Tex.	23	6–6:30 p. m.	150			Tornado	Buildings, timber and crops in path destroyed	Do.
Eastern Oklahoma	23	P. m.			50,000	Destructive hail	Crop damage not heavy but trees suffered severely; some property damage reported.	Do.
Grady, Camden, Bearden, Lonoke, Bentonville and Etna, Ark.	23	P. m.			50,000	Electrical and straight wind.	Minor wind damage; commissary at Bearden destroyed by lightning.	Do.

[1] "Mi." signifies miles, instead of yards.

Severe local hail and wind storms, April, 1926—Continued

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks	Authority
Nebraska	23–24					Strong winds	Windows, glass store fronts, signs and awnings damaged.	Lincoln Star (Nebr.).
Fairburn, Ga.	24	6:30 a. m.			1,000	Wind	Several chimneys blown down and roofs damaged.	Official, U. S. Weather Bureau.
Southeastern counties, Wis.	24	11 a. m.–midnight.	60 mi.		14,000	High winds	Plate-glass windows broken, signs, awnings, chimneys and poles blown down; car-ferries and street traffic impeded.	Do.
Green Bay, Wis., and vicinity.	24					Wind	Damage to power transmission and communication lines; traffic interrupted.	Green Bay Gazette (Wis.).
Houghton, Mich.	24				3,500	do	Many windows broken and electric circuits damaged by falling trees; roofs of two warehouses partly blown off.	Official, U. S. Weather Bureau.
Indiana	24				7,400	High winds	Damage, particularly to roofs, windows and poles, throughout State; river navigation delayed.	Do.
Kern County, Calif.	29				750,000	Electrical	Oil tanks ignited	Do.
Tehachapi, Calif.	29	3–3:20 p. m.	500		40,000–50,000	Hail	Small pears mutilated; orchards injured	Do.

STORMS AND WEATHER WARNINGS

WASHINGTON FORECAST DISTRICT

There were no severe storms east of the Mississippi River during April. No storm warnings were required for the south Atlantic or east Gulf coast, and they were issued for a part of the coast from Cape Hatteras northward for only five disturbances. Small-craft warnings were issued, however, on nine dates, mostly for the Atlantic coast, the west Florida coast receiving warnings on the 3d and 7th.

The first storm warnings of the month were ordered displayed from Delaware Breakwater to Eastport, Me., at 4:30 p. m. of the 3d in connection with a disturbance that moved northeastward from Missouri to the St. Lawrence Valley. Nearly all stations on the coast north of Cape Hatteras reported verifying velocities, the highest being 52 miles per hour from the northwest at New York City.

On the 13th northeast storm warnings were displayed from Cape Hatteras to Atlantic City, in connection with a disturbance that moved slowly eastward over the Gulf and South Atlantic States; and on the 15th northwest warnings were ordered from the Virginia Capes to Boston, because of a sharp pressure rise following the passage of a trough of low pressure that passed eastward over the Atlantic States on that date. These warnings were only partially verified.

A secondary disturbance developed over Virginia during the afternoon of the 24th, when the main storm center was over Michigan, and southeast storm warnings were issued at 10 p. m. for the north Atlantic coast from Sandy Hook, N. J., to Eastport, Me. The highest velocity reported was 48 miles per hour from the northwest at New York City.

A disturbance that moved southeastward from Manitoba with slowly increasing intensity was central over northern Indiana the evening of the 27th, and southeast storm warnings were displayed from Delaware Breakwater to Boston at 10 p. m. The only verifying velocity reported was 44 miles per hour from the south at New York City.

Frost warnings were issued on 14 dates. Few stations north of the Ohio River and Virginia required frost warnings until after the middle of the month, and they were not required in the greater part of New England and New York at the end of the month. The warnings affecting the largest areas were those of the 18th, 19th, 25th, and 28th.—*C. L. Mitchell.*

CHICAGO FORECAST DISTRICT

Storm warnings on the Great Lakes.—General navigation on the Great Lakes did not open during the month, owing to the lateness of the season and consequent adverse ice conditions. Thus, the storm-warning season proper did not begin until May 1. Warnings for the benefit of Lake shipping were confined to advisory information and forecasts for vessels on Lake Michigan. These were issued on seven dates, namely, the 4th, 13th, 15th, 21st, 23d, 24th, and 30th. The storm of the 24th–25th was rather severe. On the evening of the 23d a trough of low pressure overlay the Upper and Middle Mississippi Valley, with the lowest barometer 29.64 inches at Duluth, Minn. At the same time a large area of high pressure covered most of the northwestern quarter of the country, with crest of 30.40 inches over northern Wyoming. During the night of the 23d–24th there occurred a rather remarkable development of the low pressure area. By the morning observation of the 24th it had assumed a somewhat circular shape and had deepened until the central pressure had fallen to 29.22 inches, at Milwaukee, Wis., while the high area had increased its crest pressure to 30.56 inches, without change in position. As a result winds of gale force occurred over almost the entire forecast district on the 24th.

Frost warnings.—Because of the lateness of the season frost warnings were not required as often as in the average April. At the beginning of the month vegetation had reached the susceptible-to-frost-damage stage only in a few areas in the extreme southern part of the district, while the advance of the season thereafter was very slow until the last decade. As the month closed warnings were being issued as needed for all portions of the district, except North Dakota, northern Minnesota, and Michigan. The most general warnings were those of the 14th, 18th, 25th, and 27th.

Cold-wave warnings.—These were issued on the morning of the 14th for northeastern Indiana and southeastern Lower Michigan. The fall in temperature occurred as forecast, but the cold wave was of moderate character. Cold waves also occurred on the 5th in eastern South Dakota and southern Minnesota, and on the 14th in eastern and central North Dakota, western and northern Minnesota, and northern Upper Michigan.

Fire-weather forecasts.—Forecasts of this character were begun on the 28th for northeastern Minnesota upon request of the State Forester, St. Paul, Minn.—*C. A. Donnel.*

NEW ORLEANS FORECAST DISTRICT

Southeast storm warnings for the Texas coast were issued on the 9th, at 8:20 p. m., because of a disturbance over the Rio Grande Valley; and winds of verifying velocity occurred after midnight. Northwest storm warnings, issued on the morning of the 24th, for the east coast of Texas, failed of verification; in this instance an area of high pressure was expected to cause strong winds but lost intensity as it extended southeastward. This warning was lowered at 8 p. m.

Small-craft warnings were issued for the Texas coast on the 1st, 3d, and 21st, and for the west coast of Texas on the 24th, and were mostly justified.

Warnings of freezing temperature in the northwestern or northern portions of the district were issued on the 2d and 3d; and warnings of frost in portions of Arkansas, Oklahoma, and north Texas were issued on the 7th, 8th, 11th, 12th, 14th, 15th, 18th, 19th, 23d, 24th, and 27th.—*R. A. Dyke.*

DENVER FORECAST DISTRICT

The month was remarkably warm in all but the extreme southeastern portion of this district, on account of low pressures being rather more persistent than usual over the Southwest and the Pacific slope during the first two weeks, and numerous widespread LOWS moving along the Canadian border during the second two, the HIGHS in the meantime drifting rapidly southeastward from Montana with diminishing intensity. Precipitation was generally below normal east of the Continental Divide and in northern Utah. In Arizona and southwestern Colorado, however, unusually stormy conditions prevailed with precipitation far above normal. No cold waves or other severe weather occurred and no warnings of that character were issued. Warnings of frost and freezing temperature, most of which were verified, were issued frequently for northern New Mexico and the western Colorado fruit valleys throughout the month and for Utah after the middle of the month. Daily advices of minimum temperatures to be expected at the fruit district key stations, Roswell and El Paso, were issued as usual, and daily temperature forecasts for the benefit of orchardists in the Gunnison Valley were furnished to the special observer at Delta, Colo., beginning on the 28th, fruit in that region having then reached the critical stage.—*E. B. Gittings, jr.*

SAN FRANCISCO FORECAST DISTRICT

At the beginning of the month a disturbance of the Plateau type caused unsettled weather throughout the far western states. This continued for several days, and rains became general in Oregon and Washington on the 2d and 3d. On the 2d a disturbance about midway between the California coast and the Hawaiian Islands showed a marked development, while the usual HIGH over the northeastern North Pacific was noticeably weakened. Consequently, the special bulletin quoted below was issued on that date, constituting the first prediction of general rains for California in 40 days. As the drought was becoming serious, this forecast was given wide and prominent notice by news agencies.

A disturbance of increasing intensity is shown by vessel weather reports to be central this morning in latitude 30° N. and longitude 145° W., and moving eastward. It will be productive of unsettled weather to be followed by general rains in the State of California the first part of the coming week. It is probable that the rains will be in amounts sufficient to materially benefit grain and other growing crops.—*E. H. Bowie.*

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The storm reached the coast on Sunday, April 4, and by the morning of the 5th had covered the entire State with rain, the amounts in most cases being unusually heavy. No serious gales occurred in connection with this disturbance, but there were fresh to strong winds along the southern California coast on the night of the 4th and on the 5th. Rain continued throughout California on the 6th, when the storm had passed inland to the Plateau and Middle Rockies. Meanwhile a new disturbance had developed, and the following bulletin was issued at 10 a. m. of the 6th:

The disturbance referred to in a special bulletin issued April 2 has passed inland and this morning its center is over Utah. It has caused general and in many cases excessive rains in the State of California during the last three days. The rains were notably heavy over southern California, where the fall in instances exceeded 6 inches, while at Mount Wilson the fall was more than 9.50 inches. The heavy rains greatly relieved the drought situation in the coastal regions and valleys of northern California.

Another storm of considerable intensity has formed some distance off the California coast and it will advance eastward and bring about another period of rains over all parts of the State of California within the next 48 hours.—*E. H. Bowie.*

This storm moved onto the northern California coast during the following night and southeast storm warnings were displayed on the morning of the 7th at all seaports from Point Conception to Cape Flattery. It was an unusually severe disturbance for the season in such low latitudes, the center when off the northern California coast having pressures of about 29 inches. Moderately heavy to heavy rains ensued throughout California, with southerly gales along and off the coast. In southern California the rainfall in the mountains and in places in the lowlands was excessive. The total amount for the two storms, April 4 to 9, inclusive, was, at Los Angeles, over 7 inches, exceeding any previously recorded April rainfall at that place. Mount Wilson reported a total for the same period of 15.60 inches. Amounts in northern California were also unusually heavy, San Francisco receiving more than in any April since 1896, while April rainfall records were exceeded at numerous other places. All danger to crops from deficient moisture was removed, storage reservoirs were filled, and the enormous benefits accruing to agriculture and related industries much more than offset the relatively insignificant damage caused by floods and washouts.

Although the termination of the rainy period was anticipated in the morning forecasts of April 8, some one, doubtless a self-constituted long-range weather forecaster, announced the advent of further storms on April 9 which would affect the whole Pacific coast. As a consequence, the Los Angeles County Flood Control Committee wired the district forecast center on that date:

Newspaper reports here announce violent storm on way. Please wire collect forecast.

The following reply was sent:

No grounds for report of approaching storm. Fair weather indicated for southern California next several days.

Aside from light and local rains associated with disturbances developing or moving southward over the Plateau, no further rains occurred in California until the 17th. On the 10th an area of high pressure moving in from the Pacific Ocean began to influence the far Western States, and by the 12th and 13th produced rather warm weather in nearly all sections except the immediate coast, especially in northern California and western Washington and Oregon. Its influence lasted until the 14th.

No frosts occurred in connection with this HIGH; warnings which were based on it were not verified. Another HIGH of similar type moved northeastward from the Pacific into British Columbia on the 22d. Warnings of local frosts in eastern Washington and eastern Oregon in this case were fully justified. Because of this pressure situation, fire-weather warnings were issued for western Oregon and western Washington well in advance of the event and anticipated a protracted and acute fire hazard which prevailed over the north Pacific States and northern Idaho until the 29th. The forecast officials at Portland and Seattle effectively amplified advices from the district center concerning the approach, continuation, and termination of this period of hazard. During its continuance, records of high April temperatures were exceeded at San Francisco, San Jose, Sacramento, Red Bluff, Spokane, and Walla Walla.—*T. R. Reed.*

RIVERS AND FLOODS

By H. C. FRANKENFIELD

Numerous floods of short duration and moderate intensity occurred during April—particularly along the Atlantic coast, in the streams of the Great Lakes drainage area, in the Gulf drainage, and in the interior rivers of Indiana, Illinois, and Ohio. Warnings for these floods, as well as for more severe ones which occurred in the Wabash River, and the Colorado, Guadalupe, and Brazos Rivers of Texas, were timely and in the main accurately verified. Reports of losses indicated slight damage except in the few instances given below.

Houston, Tex., district.—The following note relative to the floods in this district is quoted from the report of the official in charge of the Weather Bureau Office at Houston, Tex.:

> The presence of much of moisture in the soil prior to the arrival of the locally heavy rains of the opening decade of the month and the more general and frequently excessive rains near the beginning of the last decade favored the heavy run-off which followed. The more moderate rainfall over the Brazos drainage area at Waco and above no doubt saved the lower part of that river from a great overflow, in view of the fact that this stream went to flood stage at Washington largely from the water received from the Yegua and smaller streams in that vicinity, where the precipitation was torrential; the Navasota stream carried a vast volume of water, but the flood water from this stream did not arrive at the Brazos until the crest had passed down from the junction point, thus merely delaying the natural fall of the trunk stream. The Trinity flood would have been more severe if the excessive rain within a radius of 30 or 40 miles of Riverside had been more widespread and further upstream.
>
> The main losses from the high stages and floods in the several streams involved were from washed highways, injury or destruction of bridges, washing of soil, much of which had been plowed but little planted, delay in planting of crops, and suspension of business.
>
> Much labor and expense was saved in the lower sections of the Brazos River bottom lands by advisory notices from this station of probable crest stages slightly under flood, thus preventing unnecessary removal of livestock and other farm property from threatened areas. On the other hand, much livestock and other property were saved in the flooded areas by timely warnings of coming flood stages. It has been impossible to secure data covering all losses and all savings. The tables inclosed herewith give data in detail on the stages of the several rivers involved, losses, and savings.

The reported losses and savings along these rivers (Trinity, Neches, Brazos, and Sabine) were as follows:

Tangible property	$25,000
Crops	10,000
Prospective crops	20,000
Suspension of business	72,500
	127,500
Savings through Weather Bureau warnings	100,000

In addition to the above losses there was of course much damage not to be estimated in dollars and cents. The chief item of this kind was a loss of 20,000 acres of prospective crops on the Sabine. The value of the warnings also undoubtedly greatly exceeded the above figure. Farmers on both the Brazos and the Sabine reported that the warnings were responsible for saving the expense of moving to higher ground; and no estimate could be made of the value of cattle saved from the lowlands of the Sabine.

Colorado River of Texas.—Of this flood the official in charge, Weather Bureau Office at San Antonio, Tex., reports as follows:

> The Colorado River was in flood from April 22 to 24, and heavy overflows occurred from Bastrop to the Gulf. * * * The warnings received wide distribution and saved considerable property. The flood caused a money loss of around $55,000 in bridges, $20,000 damage to roads, $24,000 loss to farms and growing crops (8,000 acres flooded). Practically all livestock that ranged in the lowlands were saved by timely warnings, $4,000 in saving having been reported. Many automobiles were saved from partial injury, but no estimate in money value thus saved can be obtained.

Terre Haute, Ind., district.—The flood in the Wabash River (as in the other streams of Indiana, Ohio, and Illinois) was due to a period of heavy rain near the close of the first week and at the beginning of the second, the ground having been already saturated by rains late in March. As stated by the official in charge at Terre Haute, Ind.:

> Owing to rainfall on March 31, which averaged slightly over an inch over the Wabash watershed, the river began to rise rapidly throughout its course and the flood stage was exceeded at one station, Lafayette, Ind., on April 1. A series of showers in the upper portion of the valley on April 1 and 2 kept the soil saturated and prevented any marked decline in the river stage. Another period of rainfall, in which the average was about 2 inches, over the Wabash and White River watersheds from April 6 to 8, inclusive, caused a general flood throughout the valley. On the 11th and 12th of April moderate rainfall over the lower Wabash Valley and the White River Valley increased the magnitude and duration of the flood in the lower Wabash River.

In view of the magnitude of the Wabash flood, the losses were comparatively slight. The following figures for losses and savings are partly estimated:

Tangible property (mainly bridges, highways, etc)	$8,400
Crops	1,200
Suspension of business	5,000
	14,600
Savings through Weather Bureau warnings (estimated)	30,000

Meridian, Miss., district.—The floods in the Pearl and West Pearl Rivers resulted from moderately heavy rains over an extended period in late March. The warnings, issued well in advance of damaging stages, resulted in a saving of $5,500 in movable property in addition to much livestock, the value of which could not be estimated. Losses were reported as follows:

Tangible property	$14,700
Suspension of business	5,900

In New England and eastern New York a continuation of cool and moderately dry weather served to prevent any serious materialization of the threatening conditions noted in that section in previous issues of this REVIEW. For those floods which did occur (see table) warnings were issued whenever necessary, and the resulting losses and damage were small. The Connecticut River at Hartford, Conn., was above flood stage from 12:30 p. m., April 24, to 4 p. m., May 1, with a crest stage of 20.8 feet (4.8 feet above flood stage) at 4 p. m., April 27.

In addition to the foregoing losses and savings, the following were reported:

River	Losses	Savings
Hudson	$12,000	$3,000
White (Indiana)	5,750	*1,000
Guadalupe	14,000	Unreported.
Trinity	None.	5,000

* Incomplete.

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
Atlantic drainage					
Connecticut:	Feet			Feet	
White River Junction, Vt	15	23	30	20.3	25–26.
Holyoke, Mass	9	27	27	9.0	27.
Hartford, Conn	16	24	(1)	20.8	27.
Hudson:					
Corinth, N. Y	10			10.8	26.
Albany, N. Y	12	26	27	13.0	26.
Susquehanna, Oneonta, N. Y	12	8	12	14.5	9.
Unadilla, New Berlin, N. Y	8	9	9	9.8	9.
Chenango, Sherburne, N. Y	8	9	11	8.6	9.
Cape Fear, Elizabethtown, N. C	22	15	16	22.5	15.
Peedee, Mars Bluff, S. C	17	16	18	17.7	17.
Lynches, Effingham, S. C	14	18	19	14.0	18–19.
Santee:					
Rimini, S. C	12	1	10	14.3	5.
Ferguson, S. C	12	3	21	13.4	6.
Altamaha, Everett City, Ga	10	11	20	11.0	14–15.
Oconee, Milledgeville, Ga	22	(2)	1	22.8	1.
Ocmulgee:					
Macon, Ga	18	(2)	1	20.0	Mar. 31.
Abbeville, Ga	11	5	10	12.9	Apr. 7.
East Gulf drainage					
Apalachicola:					
River Junction, Fla	18	2	5	20.8	4.
Blountstown, Fla	20	3	7	21.7	5.
Chattahoochee:					
Columbus, Ga	20	(2)		35.0	2.
Alaga, Ala	30	1	3	34.0	2.
Pearl, Columbia, Miss	18	1	3	18.6	2.
West Pearl, Pearl River, La	13	(2)	20	15.8	4.
		28	30	13.4	29.
Great Lakes Drainage					
Maumee:					
Fort Wayne, Ind	15	8	13	20.0	9.
Napoleon, Ohio	10	8	12	12.5	9.
St. Joseph, Montpelier, Ohio	10	1	2	10.8	2.
		6	10	12.2	9.
Auglaize, Defiance, Ohio	10	8	12	12.4	10–11.
Sandusky, Upper Sandusky, Ohio	13	9	9	13.0	9.
Grand:					
Eaton Rapids, Mich	5	(2)	16	5.7	Mar. 22–26.
Grand Ledge, Mich	7	1	3	7.8	Apr. 2.
		8	13	7.8	9.
Grand Rapids, Mich	11	10	11	11.3	10.
Red Cedar:					
Williamston, Mich	6	2	7	7.4	5.
		10	10	6.3	10.
East Lansing, Mich	8	10	10	8.0	10.
Mississippi drainage					
Shenango, Sharon, Pa	9	9	9	9.2	9
Tuscarawas:					
Gnadenhutten, Ohio	9	9	11	10.9	10
Coshocton, Ohio	8	9	10	8.6	10
Walhonding, Walhonding, Ohio	8	9	10	10.3	9
Scioto:					
Larue, Ohio	11	8	9	12.2	9
Prospect, Ohio	10	9	10	10.9	10
Circleville, Ohio	10	9	10	13.0	9
Wabash:					
Bluffton, Ind	11	8	10	12.5	8
Logansport, Ind	14	9	9	14.5	9
Lafayette, Ind	11	2	13	21.0	10
Terre Haute, Ind	16	7	16	20.4	13
Vincennes, Ind	14	8	20	18.9	15–16
Mount Carmel, Ill	16	7	21	22.9	6–7
Tippecanoe:					
Rochester, Ind	6	8	11	7.2	9
Norway, Ind	6	1	11	6.8	7
		14	17	6.5	14
		24	26	6.4	25
Mississippi drainage—Continued					
	Feet			Feet	
White, Decker, Ind	18	10	18	22.2	16
White, East Fork, Seymour, Ind	10	9	10	10.5	9–10
White, West Fork:					
Anderson, Ind	12	8	8	12.9	8
Noblesville, Ind	14	8	9	15.7	9
Elliston, Ind	19	8	14	24.1	11
Edwardsport, Ind	15	5	16	19.0	13
Mississippi, Louisiana, Mo	12	8	10	12.5	10
Illinois:					
Morris, Ill	13	7	14	16.4	11
Peru, Ill	14	4	(1)	19.4	12–13
Henry, Ill	10	9	(1)	13.8	14
Peoria, Ill	18	10	30	20.4	15
Havana, Ill	14	8	(1)	17.6	16–18
Beardstown, Ill	14	7	(1)	19.6	17–18
Pearl, Ill	12	7	(1)	15.9	15–19
Missouri, Washburn, N. Dak	15	19	22	17.0	22
Arkansas, Yancopin, Ark	29	16	29	30.9	21–22
Black:					
Corning, Ark	11	2	17	11.7	3–4
Black Rock, Ark	14	1	1	14.0	1
Sulphur, Ringo Crossing, Tex	20	23	24	22.4	23
West Gulf drainage					
Sabine, Logansport, La	25	(2)	2	28.9	Mar. 27
		23	28	29.6	Apr. 25
Neches, Rockland, Tex	22	26	28	22.7	26–27
Trinity:					
Dallas, Tex	25	11	11	[3] 25.5	11
		22	24	32.0	23
Trinidad, Tex	28	24	(1)	34.1	23
Liberty, Tex	25	Mar. 26	Apr. 11	26.5	Mar. 30
		Apr. 24	(1)	27.4	Apr. 30
Brazos, Washington, Tex	45	24	26	45.5	24
Little, Little River, Tex	30	22	25	41.2	22
Colorado, Columbus, Tex	28	22	24	35.8	23
Guadalupe:					
New Braunfels, Tex	20	22	22	22.4	22
Gonzales, Tex	22	21	24	36.4	21
Victoria, Tex	16	22	28	25.6	25
Nueces, Cotulla, Tex	15	23	25	15.3	24
Rio Grande:					
San Marcial, N. Mex	2	20	(1)	3.8	30
San Benito, Tex	21	24	24	22.1	24
Pacific drainage					
Colorado, Parker, Ariz	7	25	(1)	7.7	30
Salt, Phoenix, Ariz	5	7	7	5.0	7

[1] Continued at end of month.
[2] Continued from last month.
[3] Estimated.

MEAN LAKE LEVELS DURING APRIL, 1926

By UNITED STATES LAKE SURVEY

[Detroit, Mich., May 4, 1926]

The following data are reported in the "Notice to Mariners" of the above date:

Data	Lakes [1]			
	Superior	Michigan and Huron	Erie	Ontario
Mean level during April, 1926:	Feet	Feet	Feet	Feet
Above mean sea level at New York	600.12	577.82	570.80	244.92
Above or below—				
Mean stage of March, 1926	−0.07	+0.30	+0.78	+0.78
Mean stage of April, 1925	−0.72	−0.56	−0.52	−0.69
Average stage for April last 10 years	−1.54	−2.22	−1.37	−1.13
Highest recorded April stage	−2.57	−5.41	−3.38	−3.51
Lowest recorded April stage	−0.42	−0.56	−0.52	+0.08
Average departure (since 1860) April level from the March level	+0.06	+0.23	+0.54	+0.59

[1] Lake St. Clair's level: In April, 1926, 573.10 feet.

EFFECT OF WEATHER ON CROPS AND FARMING OPERATIONS, APRIL, 1926

By J. B. KINCER

General summary.—Widespread rains and wet soil delayed farm operations materially over most of the region east of the Rocky Mountains, and particularly over the central valleys and west Gulf States. More rain was needed to aid germination and stop drifting soil in the northern Great Plains. Low temperatures over the eastern half of the country made germination very slow, and at the end of the month vegetation in most sections of this area was two to three weeks late. West of the Rocky Mountains weather conditions were more favorable both for work on the land and germination of seeds, except in the Pacific Northwest where more moisture was needed. During the first week a freeze did considerable damage to fruit in Missouri and Arkansas, and to oats and barley in the lower Plains States, while later in the month there was light frost damage to fruit in the southern Appalachian region.

Small grains.—Small grains were practically at a standstill during the early part of April, because of the cold, wet weather, and developed more slowly than usual for the entire month. The heavy snow over the western Winter Wheat Belt early in the month, while retarding growth, greatly improved soil moisture conditions, and later the crop made satisfactory progress in this region. With drier weather in the eastern portion of the belt during the latter half of the month, early-seeded winter wheat made fair progress but late-seeded remained in poor condition. With favorable working conditions, the seeding of spring wheat made good progress and was practically completed at the end of the month, but germination had been delayed by lack of moisture, and some damage was done by blowing soil. Oat seeding was begun nearly to the northern border, and oats were heading in California. Rice seeding was much behind in Louisiana.

Corn and cotton.—Corn planting was practically suspended during the early part of the month by cold, wet weather, but became more active later under more favorable conditions. Germination was poor in the South, making considerable replanting necessary; warmer weather was needed for this crop.

Cotton planting was also delayed by the cold, wet weather, and germination was poor generally, necessitating much replanting in some sections. At the end of the month planting was general to southeast Oklahoma, and had begun in Virginia.

Ranges, pastures, and livestock.—Moisture conditions were very favorable over the western range country, except in the far Northwest where rain was needed. Cold and snow were somewhat unfavorable for calves and lambs in some Rocky Mountain areas early in the month, but the mild weather later was very beneficial, and livestock were mostly in good condition. Pastures made fair progress in the East and South, but were needing rain in the central and northern Plains States.

Fruit.—Fruit suffered considerably from the freeze in the Ozark regions early in the month, and some damage was done later in the lower Great Plains and the southern Atlantic coast area. Otherwise the cool weather was favorable in that blooming was delayed. At the end of the month, deciduous fruits were blooming north to West Virginia and tne lower Missouri Valley.

Miscellaneous crops.—Potatoes, tobacco, and truck crops generally were delayed by the cold, wet weather in the East and South. At the end of the month potato planting had extended northward only as far as Pennsylvania, and tobacco plants were reported small and late in the Ohio Valley, and transplanting made slow progress in south Atlantic districts. Cane was coming to a fairly good stand in Louisiana. Thinning sugar beets was making good progress in the Western States.

CLIMATOLOGICAL TABLES[1]

CONDENSED CLIMATOLOGICAL SUMMARY

In the following table are given for the various sections of the climatological service of the Weather Bureau the monthly average temperature and total rainfall; the stations reporting the highest and lowest temperatures, with dates of occurrence; the stations reporting the greatest and least total precipitation; and other data as indicated by the several headings.

The mean temperature for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperatures and precipitation are based only on records from stations that have 10 or more years of observations. Of course, the number of such records is smaller than the total number of stations.

Condensed climatological summary of temperature and precipitation by sections, April 1926

Section	Temperature								Precipitation					
			Monthly extremes								Greatest monthly		Least monthly	
	Section average	Departure from the normal	Station	Highest	Date	Station	Lowest	Date	Section average	Departure from the normal	Station	Amount	Station	Amount
	°F.	°F.		°F.			°F.		In.	In.		In.		In.
Alabama	61.2	−2.3	Evergreen	89	10	Saint Bernard	24	1	2.32	−1.97	Citronelle	5.15	Lock No. 4	0.80
Arizona	60.0	+0.6	Yuma	105	25	Greer	8	1	2.96	+2.25	Crown King	9.00	Yuma Date Orchard	0.23
Arkansas	59.1	−2.3	Lambrook	94	29	Gravette	18	1	2.65	−2.23	Texarkana	5.81	Black Rock	1.24
California	61.8	+5.8	Greenland Ranch	108	26	Ellery Lake	7	9	5.17	+3.48	Squirrel Inn	21.24	Kingston	0.10
Colorado	43.5	+1.5	Lamar	88	26	3 stations	0	[2]1	2.37	+0.45	Dolores	8.82	2 stations	0.17
Florida	69.0	−1.1	2 stations	93	[2]13	Garniers	35	1	4.53	+1.85	Hypoluxo	9.79	Key West	0.37
Georgia	62.1	−1.3	Brooklet	94	24	2 stations	24	20	2.28	−1.30	Clayton	4.78	Atlanta	0.96
Idaho	50.6	+5.9	Chattin's Flat	96	29	Driggs	−11	1	1.08	−0.36	Pete King Ranger Station.	2.57	2 stations	0.35
Illinois	46.4	−6.0	Marengo	94	30	Joliet	11	4	3.12	−0.28	Salem	6.85	Aledo	1.33
Indiana	45.8	−6.2	2 stations	87	30	Laporte	12	4	3.75	+0.26	Moores Hill	5.32	Collegeville	1.62
Iowa	46.1	−2.8	3 stations	95	30	Osage	9	5	0.91	−2.08	Clinton	2.29	Harlan	0.06
Kansas	49.6	−4.1	Cawker City	95	17	2 stations	5	3	1.39	−1.23	Chanute	3.41	Beaver	0.23
Kentucky	51.6	−4.3	Bowling Green	87	30	Farmers	16	20	3.16	−0.87	Scott	6.14	Lexington	1.54
Louisiana	64.2	−2.7	Ruston	90	23	Kelly	29	1	6.53	+1.81	Saint Francisville	12.08	Calhoun	2.00
Maryland-Delaware	50.0	−2.5	Takoma, Md	89	22	2 stations	18	20	1.75	−1.61	Westminster, Md	2.68	Washington, D. C.	0.79
Michigan	37.1	−5.4	Adrian	82	[2]21	Mio	−5	4	1.90	−0.47	Monroe	3.39	Calumet	0.46
Minnesota	41.4	−1.2	3 stations	88	[2]20	Willmar	−5	5	0.44	−1.59	Grand Meadow	2.16	2 stations	0.00
Mississippi	61.3	−3.0	Utica	92	24	5 stations	28	1	2.11	−3.12	Woodville	6.81	Hernando	0.61
Missouri	49.9	−5.2	Brunswick	91	17	Edgerton	10	1	2.46	−1.27	Columbia	4.96	Tarkio	0.50
Montana	45.9	+3.2	Savage	95	30	Pipestone Dam	−11	1	0.40	−0.76	Adel	2.12	Kenilworth	T.
Nebraska	48.2	−0.8	6 stations	96	30	Lake Minatare	8	1	0.52	−1.92	Lodgepole	1.75	2 stations	0.00
Nevada	54.0	+5.2	Logandale	98	25	Rye Patch	16	2	1.13	+0.31	Sharp	3.28	Mina	0.05
New England	38.4	−4.3	Norwalk, Conn	80	22	Pittsburg, N. H.	−10	12	2.80	−0.40	Woodstock, Vt.	4.45	Boston, Mass.	1.73
New Jersey	46.4	−3.0	Pleasantville	87	22	Runyon	14	16	2.05	−1.58	Indian Mills	2.97	Plainfield	1.39
New Mexico	49.8	−0.9	Carlsbad	92	23	Chama	10	[2]1	1.70	+0.54	Aspen Grove Ranch.	4.69	Orogrande	0.15
New York	39.5	−4.9	2 stations	83	[2]22	North Lake	−5	18	3.00	+0.12	North Lake	6.52	Chazy	1.01
North Carolina	56.1	−1.5	2 stations	90	[2]24	Mount Mitchell	9	1	2.45	−1.23	Lumberton	4.45	Swansboro	0.91
North Dakota	42.8	+1.1	Ashley	98	[2]15	Dickinson	−4	3	0.28	−1.10	Powers Lake	1.56	Fort Yates	0.00
Ohio	44.4	−5.7	Delaware	90	30	Coshocton	14	4	3.17	−0.02	Kings Mills	7.31	Marietta Exp. Farm	1.49
Oklahoma	55.5	−4.2	3 stations	89	23	Boise City	16	2	2.73	−0.64	Antlers	5.92	Buffalo	1.15
Oregon	54.8	+6.2	2 stations	99	[2]27	Fremont	9	[2]1	1.38	−0.75	Willow Creek	6.46	Arlington	0.07
Pennsylvania	44.9	−3.9	3 stations	84	22	West Bingham	9	[2]12	2.03	−1.34	Saegerstown	4.35	Brookville	0.85
South Carolina	60.3	−2.1	Kingstree	94	24	Caesar's Head	27	20	2.43	−0.59	Kershaw	5.09	Conway	1.26
South Dakota	46.6	+1.3	4 stations	98	30	Watertown	−10	5	0.28	−1.83	Oelrichs	2.00	2 stations	0.00
Tennessee	55.6	−3.2	3 stations	87	30	Rugby	19	20	2.61	−2.02	Union City	4.55	McMinnville	0.90
Texas	62.0	−4.0	Encinal	103	[2]5	Dalhart	14	1	3.88	+0.63	Sabinal	13.01	Sturdy Butte	0.41
Utah	51.0	+4.4	Saint George	92	25	Woodruff	0	2	1.74	+0.43	Alton	5.48	Lemay	0.20
Virginia	52.5	−2.4	Hopewell	92	24	Dale Enterprise	14	19	1.95	−1.34	Troy	3.24	Clarendon	0.79
Washington	53.9	+5.7	Wahluke	100	29	Bumping Lake	17	3	1.17	−1.11	Spruce	6.75	2 stations	0.04
West Virginia	47.1	−4.5	Martinsburg	87	21	Pickens	8	20	2.44	−1.07	Pickens	5.54	Burlington	0.80
Wisconsin	39.9	−3.6	Brodhead	90	30	Rest Lake	−11	8	1.69	−0.76	Lancaster	3.82	Danbury	0.40
Wyoming	43.2	+3.3	Colony	90	30	Riverside	−22	1	1.05	−0.41	Elk Mountain	3.50	Eden	0.00
Alaska, March	34.4	+8.7	Ketchikan	62	[2]14	Allakaket	−45	1	8.04	+4.51	Latouche	37.27	Matanuska	0.12
Hawaii	69.5	−0.8	2 stations	89	[2]14	2 stations	46	[2]3	3.32	−5.03	Awini	23.51	3 stations	0.00
Porto Rico	76.4	+1.2	Canovanas	96	1	Aibonito	49	3	2.76	−1.98	San Sebastian	10.64	Santa Rita	0.00

[1] For description of tables and charts, see REVIEW, January, 1926, p. 32.
[2] Other dates also.

TABLE 1.—*Climatological data for Weather Bureau stations, April, 1926*

Districts and stations	Elevation or instruments: Barometer above sea level	Elevation or instruments: Thermometer above ground	Elevation or instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max. + mean min. ÷ 2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer	Mean temperature of the dew point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with .01, or more	Wind: Total movement	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
New England	*Ft.*	*Ft.*	*Ft.*	*In.*	*In.*	*In.*	*°F.*	*°F.*	*°F.*		*°F.*	*°F.*		*°F.*	*°F.*	*°F.*	*°F.*	*%*	*In.*	*In.*		*Miles.*								*0–10*	*In.*	*In.*
							40.6	−3.3										67	2.30	−0.7											5.1		
Eastport	76	67	85	29.74	29.82	−.11	35.6	−3.4	56	23	42	16	12	29	23	33	30	82	1.86	−1.1	13	8,898	w.	48	e.	1	5	7	18	6.9	6.7	0.0
Greenville, Me	1,070	6	----	28.66	29.85	----	31.6	----	58	22	40	9	12	23	33	----	----	----	2.63	----	12	6,859	nw.	34	----	20	12	4	14	----	16.0	----
Portland, Me	103	82	117	29.77	29.89	−.07	39.0	−4.0	70	22	46	18	12	32	29	34	26	61	2.71	−0.4	11	7,741	nw.	36	nw.	20	15	7	8	4.6	4.6	0.0
Concord	289	70	79	29.57	29.89	−.10	39.6	−3.8	73	22	49	18	13	30	36	----	----	----	2.36	−0.4	9	5,269	nw.	27	nw.	4	15	8	7	4.0	4.8	0.0
Burlington	403	11	48	29.46	29.91	−.08	36.5	−6.8	68	22	44	16	12	29	34	----	----	----	2.56	+0.7	13	8,302	nw.	38	s.	14	6	10	14	6.6	6.6	0.0
Northfield	876	12	60	28.94	29.91	−.08	34.4	−5.9	69	22	44	6	12	25	38	30	25	69	2.47	+0.4	13	6,580	s.	31	ne.	15	8	10	12	6.3	6.2	0.0
Boston	125	115	188	29.76	29.90	−.07	44.8	−1.6	78	22	53	21	12	36	32	38	30	69	1.73	−1.8	8	8,187	w.	33	nw.	20	9	14	7	4.7	T.	0.0
Nantucket	12	14	90	29.89	29.90	−.07	42.3	−1.1	70	23	49	28	20	36	24	38	34	75	2.11	−0.5	9	12,334	sw.	44	sw.	1	7	14	9	5.6	T.	0.0
Block Island	26	11	46	29.88	29.91	−.07	42.0	−2.0	66	23	48	26	12	36	22	37	33	73	1.91	−1.7	8	13,796	sw.	48	nw.	17	14	8	8	4.2	0.0	0.0
Providence	160	215	251	29.74	29.91	−.07	43.9	−2.7	78	22	53	21	12	35	33	37	27	53	2.12	−1.6	8	11,450	nw.	53	nw.	17	13	8	9	4.6	0.6	0.0
Hartford	159	122	140	29.75	29.93	−.06	44.0	−2.7	79	22	53	22	12	35	34	----	----	----	2.50	−1.1	8	----	nw.	----	----	----	13	8	9	4.7	0.1	0.0
New Haven	106	74	153	29.82	29.94	−.05	44.8	−2.4	79	22	53	25	12	36	37	39	32	63	3.00	−0.6	10	8,064	nw.	36	nw.	15	11	12	7	4.3	T.	0.0
Middle Atlantic States							43.8	−2.5										61	194	−1.2										5.3		
Albany	97	102	115	29.82	29.93	−.07	42.2	−4.6	77	22	51	21	12	33	32	37	31	67	2.33	−0.1	12	6,065	nw.	32	sw.	24	11	8	11	5.2	0.6	0.0
Binghamton	871	10	84	29.00	29.95	−.07	40.6	−4.8	74	22	50	20	12	31	39	----	----	----	2.46	+0.2	14	5,943	nw.	36	sw.	3	8	6	16	6.5	0.2	0.0
New York	314	414	454	29.61	29.95	−.05	46.0	−3.4	79	22	54	27	20	38	32	39	31	60	1.76	−1.5	8	15,596	nw.	62	nw.	1	4	18	8	6.1	T.	0.0
Harrisburg	374	94	104	29.58	29.99	−.03	47.6	−3.3	77	22	57	26	12	39	30	39	29	52	1.86	−0.6	9	6,766	nw.	34	sw.	25	9	8	13	5.8	T.	0.0
Philadelphia	114	123	190	29.86	29.98	−.03	50.4	−1.7	83	22	60	29	12	41	31	42	35	60	1.81	−1.1	8	7,990	nw.	33	nw.	24	8	10	12	5.9	T.	0.0
Reading	325	81	98	29.62	29.97	----	47.8	----	78	22	57	26	12	39	32	42	36	67	1.96	−1.3	9	6,474	w.	29	w.	25	9	11	10	5.6	T.	0.0
Scranton	805	111	119	29.09	29.96	−.05	43.3	−4.8	77	22	53	20	12	34	39	36	28	57	2.20	−0.5	9	6,819	nw.	35	sw.	25	6	6	18	7.2	T.	0.0
Atlantic City	52	37	172	29.92	29.98	−.02	47.6	−0.2	81	22	55	28	20	40	28	42	35	66	1.47	−1.5	9	13,980	w.	50	se.	3	10	14	6	4.4	0.0	0.0
Cape May	17	13	49	30.00	30.02	−.03	50.1	+1.7	85	22	58	32	20	42	31	44	38	69	2.50	−0.5	9	7,367	nw.	----	----	----	11	13	6	----	0.0	0.0
Sandy Hook	22	10	55	29.93	29.95	----	45.8	----	74	22	53	29	12	39	26	39	32	64	1.68	----	8	12,859	nw.	48	nw.	1	7	14	9	5.5	T.	0.0
Trenton	190	159	183	29.76	29.96	----	47.2	----	80	22	57	26	12	38	33	40	34	63	2.01	−1.3	9	9,930	nw.	43	nw.	3	6	11	13	5.9	T.	0.0
Baltimore	123	100	113	29.85	29.98	−.03	51.6	−2.0	85	22	61	30	20	42	37	43	34	56	1.46	−1.8	8	5,124	sw.	26	sw.	1	10	11	9	5.4	0.5	0.0
Washington	112	62	85	29.86	29.99	−.03	51.9	−1.4	86	22	62	29	20	41	39	43	32	52	0.79	−2.5	10	6,373	nw.	34	nw.	3	10	11	9	5.5	T.	0.0
Cape Henry	18	8	54	29.97	29.99	----	54.2	----	91	22	64	36	20	45	35	47	42	70	2.21	−1.7	8	11,528	sw.	47	n.	28	14	9	7	4.3	0.0	0.0
Lynchburg	681	153	188	29.25	29.99	−.03	54.4	−2.9	85	30	66	30	13	43	42	45	37	56	1.82	−1.4	6	7,156	w.	37	w.	1	12	13	5	4.6	1.7	0.0
Norfolk	91	170	205	29.91	30.01	.00	55.3	−1.5	84	22	65	33	20	46	33	47	40	64	2.45	−1.3	8	11,414	s.	48	w.	1	14	9	7	4.5	0.0	0.0
Richmond	144	11	52	29.85	30.01	−.01	54.5	−2.1	86	22	66	29	20	43	39	46	38	59	2.01	−1.4	6	7,755	sw.	37	w.	25	21	4	5	3.0	T.	0.0
Wytheville	2,304	49	55	27.61	30.00	−.03	48.4	−3.6	75	30	60	28	27	37	36	41	34	63	1.92	−1.7	9	6,259	w.	32	w.	1	9	13	8	5.5	0.2	0.0
South Atlantic States							60.5	−1.4										68	2.29	−1.0										4.2		
Asheville	2,253	70	84	27.67	30.03	.00	52.1	−1.8	77	30	64	29	4	40	38	44	36	62	1.68	−1.5	7	6,350	n.	39	n.	3	13	11	6	3.9	0.0	0.0
Charlotte	779	55	62	29.18	30.02	−.01	58.6	−1.2	85	24	70	33	20	47	35	50	44	64	1.28	−2.2	8	4,382	sw.	31	w.	8	12	11	7	4.7	T.	0.0
Hatteras	11	11	50	29.99	30.00	−.01	57.8	−2.0	75	7	64	38	20	52	21	53	50	78	2.39	−2.0	7	12,594	sw.	48	n.	13	17	5	8	4.0	0.0	0.0
Raleigh	376	103	110	29.60	30.01	−.02	57.8	−1.6	85	24	69	31	20	46	36	50	44	66	1.64	−1.8	8	6,998	sw.	32	sw.	8	13	10	7	4.7	0.0	0.0
Wilmington	78	81	91	29.95	30.03	.00	60.6	−1.4	82	18	70	34	20	51	28	53	49	73	3.34	+0.5	10	6,503	sw.	27	sw.	8	15	7	8	4.4	0.0	0.0
Charleston	48	11	92	29.99	30.04	+.01	62.8	−1.7	84	24	71	41	20	55	24	56	51	73	2.48	−0.5	6	7,712	sw.	30	ne.	12	15	8	7	4.1	0.0	0.0
Columbia, S. C	351	41	57	29.64	30.03	.00	62.1	−1.2	86	24	73	38	1	51	40	52	44	60	1.94	−0.9	8	5,640	w.	32	sw.	8	16	8	6	3.9	0.0	0.0
Due West	711	10	55	29.28	30.06	----	59.0	----	83	30	71	33	1	47	40	----	----	----	1.68	----	9	7,649	sw.	38	w.	8	14	8	8	4.2	0.0	0.0
Greenville, S. C	1,039	139	146	28.91	30.00	----	59.0	+0.4	82	30	70	34	1	48	35	49	40	56	2.08	----	8	8,044	sw.	36	w.	8	13	12	5	4.0	0.0	0.0
Augusta	182	62	77	29.83	30.02	−.01	62.8	−1.4	86	24	75	39	2	51	37	55	50	67	2.02	−1.5	8	4,481	nw	29	w.	8	15	10	5	4.0	0.0	0.0
Savannah	65	150	194	29.97	30.04	+.01	64.8	−1.2	88	24	75	42	1	55	29	56	52	73	2.24	−0.8	7	8,820	s.	46	sw.	11	15	8	7	3.8	0.0	0.0
Jacksonville	43	209	245	30.01	30.06	+.02	66.6	−2.1	87	24	75	45	1	58	25	58	54	71	3.89	+1.2	7	7,963	sw.	33	e.	19	16	5	9	4.4	0.0	0.0
Florida Peninsula							74.1	+0.5										74	2.80	+0.7										5.0		
Key West	22	10	64	30.00	30.02	.00	77.6	+1.9	88	13	83	66	1	72	19	71	68	76	0.37	−0.9	7	7,421	se.	33	nw.	16	18	5	7	4.1	0.0	0.0
Miami	25	71	79	30.03	30.06	----	74.8	+0.6	89	13	81	56	1	69	20	68	65	74	2.29	−1.0	8	5,025	se.	24	nw.	8	3	19	8	6.2	0.0	0.0
Tampa	35	79	87	30.01	30.05	−.01	69.8	−1.1	87	10	78	54	5	61	27	63	59	73	5.75	+3.9	9	4,357	e.	26	nw.	3	9	14	7	5.1	0.0	0.0
Titusville	44	5	----	30.01	30.06	----	69.6	----	93	24	80	46	2	59	31	----	----	----	7.18	----	6	----	se.	----	----	----	12	8	10	4.6	0.0	0.0
East Gulf States							62.4	−2.3										67	2.87	−1.2										4.7		
Atlanta	1,173	190	216	28.80	30.04	+.01	59.0	−2.0	81	30	69	32	1	49	33	50	41	57	0.96	−2.7	9	7,944	nw.	38	nw.	24	13	7	10	4.6	0.0	0.0
Macon	370	78	87	29.64	30.04	+.01	61.8	−2.1	85	10	74	37	1	50	39	53	46	60	2.04	−1.4	9	4,604	nw.	25	s.	7	14	9	7	4.1	0.0	0.0
Thomasville	273	49	58	29.75	30.05	+.02	65.8	−0.9	86	10	77	41	1	55	31	57	51	66	3.49	−0.2	5	3,367	sw.	21	e.	3	11	9	10	5.0	0.0	0.0
Apalachicola	36	42	49	30.01	30.05	----	65.2	----	79	8	72	46	1	59	19	60	57	79	6.69	----	8	5,493	s.	34	se.	3	17	6	7	3.7	0.0	0.0
Pensacola	56	149	185	30.00	30.05	+.03	64.0	−2.7	77	12	70	45	4	58	25	59	55	76	4.55	+1.4	10	9,193	n.	57	se.	11	11	7	12	5.3	0.0	0.0
Anniston	741	9	57	29.27	30.07	+.04	59.0	−1.4	83	23	72	29	1	46	44	----	----	----	0.90	−2.7	10	4,046	nw.	33	nw.	24	12	14	4	4.2	0.0	0.0
Birmingham	700	11	48	29.30	30.06	+.04	59.9	−3.4	82	23	72	32	1	48	32	51	43	59	1.77	−1.9	9	5,097	nw.	30	nw.	24	12	11	7	4.4	0.0	0.0
Mobile	57	125	161	29.99	30.05	+.03	64.5	−1.8	79	28	74	42	1	56	26	57	53	72	3.69	−0.7	9	6,865	n.	42	sw.	11	10	10	10	5.5	0.0	0.0
Montgomery	223	100	112	29.81	30.06	+.03	62.8	−2.5	83	6	74	38	1	52	34	54	46	61	1.47	−2.8	7	4,979	nw.	29	nw.	24	11	11	8	4.4	0.0	0.0
Corinth	469	6	----	----	----	----	59.4	----	85	30	72	28	1	47	38	----	----	----	1.14	----	9	----	s.	----	----	----	8	16	6	----	0.0	0.0
Meridian	375	87	95	29.65	30.05	+.03	60.8	−3.2	86	23	72	33	1	49	36	53	46	65	3.07	−2.0	8	3,994	nw.	29	w.	24	11	14	5	4.6	0.0	0.0
Vicksburg	247	65	73	29.79	30.07	+.07	62.2	−3.4	84	23	72	37	1	52	33	53	46	63	3.28	−1.9	8	4,560	n.	26	e.	10	12	6	12	5.0	0.0	0.0
New Orleans	53	76	84	29.99	30.04	+.04	67.0	−1.8	87	23	75	48	1	59	23	60	56	75	6.39	+1.5	8	4,727	n.	32	sw.	10	10	9	11	5.5	0.0	0.0
West Gulf States							63.2	−3.2										73	4.34	+0.7										5.3		
Shreveport	249	77	93	29.78	30.05	+.08	62.4	−3.4	85	23	71	40	1	53	31	54	49	69	5.14	+0.6	8	4,826	s.	28	nw.	21	11	9	10	5.3	0.0	0.0
Bentonville	1,303	11	44	----	----	----	54.4	−2.5	80	30	65	29	1	44	39	----	----	----	2.45	----	10	4,656	s.	35	w.	23	16	6	8	----	0.0	0.0
Fort Smith	457	79	94	29.54	30.02	+.06	58.4	−3.4	86	23	69	32	1	48	38	50	44	64	1.86	−2.0	10	6,387	e.	49	nw.	23	13	7	10	4.9	0.0	0.0
Little Rock	357	136	144	29.65	30.03	+.05	59.2	−2.9	83	23	70	36	1	49	37	50	42	60	3.11	−1.4	11	6,805	s.	46	se.	21	13	8	9	4.3	0.0	0.0
Brownsville	57	53	61	29.90	29.96	----	71.9	−1.8	91	7	79	53	1	65	27	65	63	82	2.97	----	5	5,977	se.	28	s.	21	8	13	9	5.7	0.0	0.0
Corpus Christi	20	11	73	29.99	30.01	+.06	68.8	−2.0	87	7	74	54	16	64	24	63	61	80	2.37	+0.6	9	9,154	se.	39	se.	21	3	15	12	6.7	0.0	0.0
Dallas	512	109	117	29.48	30.03	----	61.0	----	82	27	70	37	3	52	33	----	----	----	5.87	----	7	5,874	s.	32	e.	21	12	9	9	4.9	0.0	0.0
Fort Worth	670	106	114	29.30	30.01	+.07	60.6	−4.4	82	27	70	37	3	52	33	53	47	68	3.73	−0.4	8	6,492	s.	54	se.	10	7	12	11	5.8	0.0	0.0
Galveston	54	106	114	29.98	30.04	+.07	66.6	−2.1	80	22	72	52	8	62	21	61	59	81	5.49	+2.4	6	7,832	se.	37	w.	10	11	10	10	3.3	0.0	0.0
Groesbeck	461	11	56	29.54	30.03	----	60.8	----	83	18	70	39	3	52	34	----	----	----	4.19	----	9	7,211	s.	41	e.	10	9	7	14	5.9	0.0	0.0
Houston	138	292	314	29.89	30.04	----	65.8	−3.5	82	18	74	46	1	58	25	----	----	----	2.97	----	7	9,204	e.	56	e.	20	11	14	5	4.6	0.0	0.0
Palestine	510	64	72	29.50	30.04	+.08	61.8	−4.2	82	18	71	39	3	53	32	55	51	72	4.35	+0.3	6	5,361	s.	36	w.	6	8	10	12	5.4	0.0	0.0
Port Arthur	34	58	66	29.99	30.03	----	66.7	----	82	22	74	48	16	60	21	61	58	79	4.22	----	7	5,424	se.	30	ne.	7	11	11	8	4.9	0.0	0.0
San Antonio	693	119	132	29.28	30.00	+.07	65.7	−3.4	84	18	75	42	1	56	30	59	55	73	7.06	+4.1	11	5,315	ne.	44	sw.	20	9	10	11	5.6	0.0	0.0
Taylor	583	55	63	29.44	30.06	+.11	62.5	−5.0	85	18	72	39	3	53	33	----	----	----	5.91	+1.9	11	5,941	s.	38	nw.	24	7	8	15	6.3	0.0	0.0

TABLE 1.—*Climatological data for Weather Bureau stations, April, 1926*—Continued

Districts and stations	Elevation or instruments: Barometer above sea level	Elevation or instruments: Thermometer above ground	Elevation or instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max. + mean min. ÷2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer	Mean temperature of the dew point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with .01, or more	Wind: Total movement	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
	Ft.	*Ft.*	*Ft.*	*In.*	*In.*	*In*	°*F.*	°*F.*	°*F.*		°*F.*	°*F.*		°*F.*	°*F.*	°*F.*	°*F.*	%	*In.*	*In.*		*Miles.*								0–10	*In.*	*In.*
Ohio Valley and Tennessee							**49.8**	**−5.0**										**64**	**2.70**	**−0.9**										**5.7**		
Chattanooga	762	189	213	29.21	30.03	.00	57.6	−2.7	83	30	69	32	1	46	36	48	39	56	1.57	−2.8	11	6,345	sw.	31	sw.	10	14	8	8	4.5	0.0	0.0
Knoxville	995	102	111	28.96	30.02	−.01	55.6	−2.4	82	30	67	33	20	44	36	47	38	57	3.14	−1.5	10	5,762	sw.	35	sw.	22	14	8	8	4.5	0.0	0.0
Memphis	399	76	97	29.61	30.04	+.04	58.3	−3.5	81	17	68	35	1	49	27	49	42	60	1.67	−3.2	8	6,438	sw.	•51	nw.	23	14	7	9	4.2	0.0	0.0
Nashville	546	168	191	29.47	30.06	+.05	55.8	−3.2	84	30	67	31	1	45	35	47	39	58	2.45	−1.9	10	7,368	w.	45	nw.	27	10	14	6	4.7	0.0	0.0
Lexington	989	193	230	28.96	30.04	+.02	48.8	−5.5	78	30	58	26	4	39	36	----	----	----	1.54	−1.8	11	9,699	sw.	50	sw.	27	10	9	11	5.7	T.	0.0
Louisville	525	188	234	29.46	30.05	+.04	50.2	−6.2	81	30	60	30	4	40	38	44	38	66	4.30	+0.2	11	8,857	ne.	36	n.	14	10	7	13	5.4	T.	0.0
Evansville	431	139	175	29.59	30.06	+.06	51.1	−5.6	82	30	61	30	1	41	34	44	36	61	2.39	−1.1	12	9,289	ne.	48	w.	24	5	18	7	5.6	T.	0.0
Indianapolis	822	194	230	29.13	30.04	+.04	45.6	−6.5	81	30	55	26	1	36	33	40	34	68	3.91	+0.4	16	10,084	sw.	52	w.	24	9	8	13	5.8	0.7	0.0
Royal Center	736	11	55	29.21	30.03	----	41.8	----	83	30	51	20	4	32	31	----	----	----	3.03	----	12	9,214	sw.	49	sw.	24	5	12	13	6.2	6.5	0.0
Terre Haute	575	96	129	29.41	30.04	----	46.7	----	82	30	56	28	1	37	31	41	36	72	4.06	----	13	8,643	ne.	42	sw.	24	9	10	11	5.8	T.	0.0
Cincinnati	627	11	51	29.35	30.04	+.03	46.8	−5.6	81	30	57	25	4	37	33	----	36	69	4.99	+2.0	13	7,405	sw.	46	sw.	24	8	8	14	6.1	T.	0.0
Columbus	822	179	222	29.14	30.03	+.01	44.6	−6.6	80	30	55	24	15	34	36	40	35	72	2.56	−0.3	10	7,938	w.	40	nw.	25	8	8	14	6.2	1.6	0.0
Dayton	899	137	173	29.05	30.02	----	45.6	−6.0	81	30	56	26	15	35	35	39	33	65	2.21	−0.7	12	8,612	sw.	46	w.	24	9	9	12	6.0	0.6	0.0
Elkins	1,947	59	67	27.95	30.04	+.01	44.6	−4.2	75	30	55	14	20	34	37	39	32	68	3.90	+0.6	14	5,336	w.	37	w.	3	4	7	19	7.3	5.3	0.0
Parkersburg	637	77	82	29.38	30.04	+.01	48.2	−5.2	83	30	59	25	20	38	35	40	32	59	1.76	−1.2	10	5,263	sw.	34	w.	3	6	8	16	6.7	0.1	0.0
Pittsburgh	842	353	410	29.09	30.01	−.01	44.9	−6.3	80	30	55	23	15	35	34	38	31	63	1.46	−1.4	14	10,128	w.	52	w.	24	4	9	17	6.9	0.9	0.0
Lower Lake Region							**39.5**	**−6.0**										**70**	**3.55**	**+1.2**										**6.2**		
Buffalo	767	247	280	29.11	29.96	−.05	35.0	−7.8	69	24	42	16	15	28	31	31	27	75	3.93	+1.5	17	14,051	sw.	68	sw.	1	6	10	14	6.3	7.4	0.0
Canton	448	10	61	29.41	29.89	----	34.5	−8.0	70	24	43	7	6	26	39	----	----	----	3.14	+0.9	16	8,713	w.	41	sw.	25	14	4	12	5.0	12.2	T.
Oswego	335	76	91	----	29.94	−.07	37.2	−6.4	72	24	44	18	15	30	33	----	----	74	3.21	+1.0	13	----	w.	34	w.	4	11	6	13	----	9.9	0.0
Rochester	523	86	102	29.38	29.96	−.05	39.7	−5.2	73	24	48	20	15	32	30	33	27	66	3.12	+0.7	15	8,308	w.	38	sw.	28	8	8	14	6.4	1.5	0.0
Syracuse	597	97	113	29.29	29.94	−.07	39.1	−5.3	73	24	47	18	15	31	35	----	----	----	3.22	+0.9	15	7,368	w.	43	nw.	4	6	10	14	6.6	5.1	0.0
Erie	714	130	166	29.20	29.98	.00	39.8	−5.3	73	30	48	20	15	31	37	36	31	73	3.75	+1.4	12	11,741	w.	56	sw.	3	8	8	14	6.1	5.3	0.0
Cleveland	762	190	201	29.17	30.00	−.02	41.5	−4.7	79	30	50	24	12	33	39	36	31	69	3.44	+1.1	14	11,173	w.	52	w.	3	5	7	18	6.9	3.1	0.0
Sandusky	629	62	70	29.30	29.99	−.03	42.1	−5.1	80	30	50	26	4	34	38	----	----	----	3.55	+1.0	14	7,694	sw.	35	nw.	25	3	11	16	7.1	2.6	0.0
Toledo	628	208	243	29.31	30.01	.00	42.2	−5.4	80	30	51	23	15	34	35	37	31	67	5.12	+2.8	14	12,013	sw.	60	sw.	24	8	11	11	5.7	2.9	0.0
Fort Wayne	856	113	124	29.06	30.00	----	42.2	−7.1	82	30	52	23	15	33	33	37	32	69	3.84	----	12	8,198	sw.	42	sw.	24	12	6	12	5.6	6.8	0.0
Detroit	730	218	258	29.19	30.00	−.02	41.0	−5.2	80	21	50	21	4	32	37	34	27	63	3.04	+0.7	14	8,758	sw.	47	sw.	24	7	10	13	6.0	9.0	0.0
Upper Lake Region							**37.0**	**−4.7**										**70**	**1.56**	**−0.7**										**5.0**		
Alpena	609	13	92	29.30	29.98	−.04	33.0	−5.6	65	22	42	8	4	24	35	30	25	72	1.58	−0.6	11	9,348	nw.	44	nw.	16	11	13	6	4.9	7.1	0.0
Escanaba	612	54	60	29.32	30.01	−.01	33.3	−4.6	81	21	42	13	6	24	47	29	23	72	1.18	−0.9	9	8,039	n.	46	n.	24	18	3	9	4.2	6.2	0.0
Grand Haven	632	54	89	29.31	30.01	.00	37.0	−6.7	68	23	44	19	15	30	31	33	28	72	1.60	−0.8	11	9,496	n.	40	nw.	24	11	9	10	5.1	7.8	0.0
Grand Rapids	707	70	87	29.23	30.02	.00	40.4	−6.6	76	21	50	20	15	31	31	35	28	65	1.99	−0.5	10	5,257	nw.	26	nw.	1	9	11	10	5.4	11.2	0.0
Houghton	668	62	99	29.25	29.99	−.03	33.5	−4.2	69	21	42	12	15	24	42	----	----	----	0.80	−1.2	12	7,524	w.	50	n.	24	6	11	13	6.1	6.6	0.0
Lansing	878	11	62	29.03	29.99	----	39.3	−6.3	79	21	50	16	4	28	37	34	30	72	2.50	0.0	10	6,004	w.	31	nw.	3	11	11	8	5.2	10.7	0.0
Ludington	637	60	66	29.29	30.00	----	35.9	----	63	22	42	19	15	30	32	32	27	71	1.30	----	9	8,605	s.	44	n.	24	13	10	7	4.4	2.9	0.0
Marquette	734	77	111	29.18	30.00	−.02	34.6	−3.2	77	21	43	16	14	26	38	30	24	69	1.50	−0.5	11	8,345	nw.	50	sw.	15	4	15	11	6.4	12.4	0.0
Port Huron	638	70	120	29.27	29.98	+.04	38.0	−5.0	79	21	47	18	4	29	39	34	29	75	2.69	+0.6	12	9,469	sw.	48	n.	3	9	10	11	5.5	15.8	0.0
Saginaw	641	----	----	29.26	29.97	----	39.4	−5.5	80	21	50	18	4	28	36	----	----	----	2.40	----	12	----	w.	----	----	----	9	7	14	----	7.3	0.0
Sault Sainte Marie	614	11	52	29.27	29.99	−.04	30.4	−7.0	59	23	38	10	4	22	27	27	23	76	0.50	−1.6	10	7,547	nw.	44	nw.	16	11	13	6	4.9	4.7	0.0
Chicago	673	7	131	29.31	30.05	+.05	42.0	−4.9	87	30	50	22	4	34	42	36	31	70	1.96	−0.9	9	10,382	sw.	44	sw.	24	10	7	13	5.5	7.3	0.0
Green Bay	617	109	141	29.32	29.99	−.02	39.6	−3.6	80	21	50	18	5	30	36	34	28	68	1.95	−0.5	8	9,625	s.	52	n.	24	13	11	6	4.4	3.3	0.0
Milwaukee	681	125	139	29.26	30.02	+.03	40.9	−2.9	81	30	49	21	1	32	41	35	29	66	1.51	−1.2	8	8,728	w.	46	se.	24	13	9	8	4.8	3.1	0.0
Duluth	1,133	5	47	28.77	30.01	.00	37.0	0.0	74	20	48	8	14	26	41	31	23	61	0.48	−1.7	4	9,858	sw.	50	sw.	15	18	5	7	3.9	1.8	0.0
North Dakota							**42.9**	**+2.2**										**54**	**0.23**	**−1.6**										**3.8**		
Moorhead	940	50	58	28.99	30.02	+.03	42.0	+1.4	86	29	57	13	2	27	53	34	24	53	0.08	−2.2	4	7,291	n.	32	nw.	21	10	9	11	5.3	0.3	0.0
Bismarck	1,674	8	57	28.27	30.08	+.11	44.6	+2.5	89	29	59	10	3	30	49	35	24	53	0.11	−1.8	4	7,590	nw.	38	nw.	23	20	5	5	2.9	0.2	0.0
Devils Lake	1,478	11	44	28.43	30.03	+.04	40.4	+2.2	87	29	55	7	1	26	50	32	23	58	0.49	−1.5	5	7,855	nw.	38	n.	27	18	7	5	3.2	1.5	0.0
Ellendale	1,457	10	56	28.48	30.07	----	41.6	----	87	15	58	7	1	25	55	----	----	----	0.44	----	6	11,210	nw.	50	n.	24	12	9	9	4.5	1.6	0.0
Grand Forks	835	12	89	----	----	----	41.2	----	86	29	56	13	14	27	57	34	----	----	0.25	----	7	----	n.	54	s.	19	15	10	5	3.6	0.4	0.0
Williston	1,878	41	48	28.02	30.03	+.07	44.6	+2.6	90	30	59	8	3	31	46	36	25	51	0.24	−1.0	5	6,971	nw.	38	w.	22	16	10	4	3.5	1.2	0.0
Upper Mississippi Valley							**48.9**	**−4.3**										**64**	**2.27**	**−0.7**										**4.7**		
Minneapolis	918	102	208	29.00	29.99	----	44.2	−2.2	80	20	55	14	5	33	40	----	----	----	0.58	−1.9	5	8,769	nw.	49	n.	24	17	6	4	3.9	2.8	0.0
St. Paul	837	236	261	29.11	30.03	+.04	43.7	−1.9	78	29	55	9	5	33	39	----	----	----	0.53	−1.8	5	9,451	nw.	44	nw.	16	17	8	5	3.5	4.2	0.0
La Crosse	714	11	48	29.24	30.03	+.05	44.4	−2.8	79	30	56	20	5	33	35	----	----	----	1.81	−0.5	6	4,554	nw.	24	nw.	24	12	11	7	4.6	2.9	0.0
Madison	974	70	78	28.97	30.04	+.05	41.6	−3.8	80	30	51	19	5	32	35	36	30	67	1.49	−0.9	6	7,617	sw.	42	nw.	24	14	6	10	5.0	1.1	0.0
Wausau	1,247	4	----	28.64	30.04	----	39.4	----	77	21	50	14	5	29	33	----	----	----	1.10	----	5	----	nw.	----	----	----	13	12	5	4.4	2.8	0.0
Charles City	1,015	10	49	28.96	30.05	+.07	44.0	−2.4	83	30	56	15	5	32	40	36	28	59	1.58	−1.2	6	5,580	nw.	29	nw.	24	18	7	5	3.3	1.8	0.0
Davenport	606	71	79	29.38	30.05	+.07	44.8	−5.1	89	30	55	20	1	35	35	39	32	65	1.84	−1.0	8	5,799	w.	31	w.	24	13	7	10	4.8	3.3	0.0
Des Moines	861	84	97	29.13	30.05	+.08	47.8	−2.3	92	30	59	23	15	37	37	39	30	56	0.82	−2.2	2	6,015	sw.	33	sw.	20	12	4	14	5.5	T.	0.0
Dubuque	700	81	96	29.26	30.02	+.04	44.4	−4.2	87	30	54	22	1	35	38	38	30	62	2.24	−0.7	6	5,382	nw.	29	nw.	23	11	9	10	5.4	2.8	0.0
Keokuk	614	64	78	29.38	30.06	+.08	46.0	−6.3	84	30	56	20	1	36	33	40	32	63	1.85	−1.5	7	6,578	sw.	38	nw.	24	13	5	12	5.1	9.2	0.0
Cairo	358	87	93	29.65	30.04	+.05	53.9	−4.2	83	30	64	29	1	44	32	46	39	64	3.02	−0.6	10	7,880	n.	40	sw.	27	10	9	11	5.3	0.0	0.0
Peoria	609	11	45	29.39	30.06	+.07	44.0	−6.9	84	30	54	19	1	34	35	39	33	71	2.60	−0.7	8	6,161	s.	35	w.	24	13	7	10	4.8	7.4	0.0
Springfield, Ill	636	10	91	29.35	30.04	+.06	46.4	−6.3	84	30	56	22	1	37	38	40	35	70	5.05	+1.7	13	7,093	ne.	31	w.	24	12	7	11	5.0	0.4	0.0
Hannibal	534	74	109	29.47	30.06	+.08	46.6	−6.8	83	30	56	19	1	37	34	----	----	----	3.93	+0.7	10	7,556	ne.	38	w.	24	12	8	10	4.9	5.6	0.0
St. Louis	568	265	303	29.42	30.04	+.06	50.3	−5.5	83	30	60	28	1	41	32	42	34	60	4.42	+0.9	10	8,719	n.	38	n.	7	12	10	8	4.5	T.	0.0
Missouri Valley							**48.9**	**−2.1**										**54**	**1.32**	**−1.7**										**4.7**		
Columbia, Mo	784	11	84	29.20	30.05	+.07	48.3	−6.6	83	17	59	20	1	38	41	----	----	----	4.96	+1.3	11	7,231	ne.	38	nw.	25	14	4	12	4.9	0.8	0.0
Kansas City	963	161	181	29.02	30.07	+.11	49.3	−5.5	86	17	59	24	3	40	41	43	37	68	2.52	−0.8	8	9,235	ne.	49	nw.	24	11	10	9	5.0	6.5	0.0
St. Joseph	967	11	49	29.01	30.06	----	49.6	----	89	17	60	21	3	39	46	41	33	61	1.66	----	7	6,698	ne.	49	nw.	24	14	7	9	4.3	11.0	0.0
Springfield, Mo	1,324	98	104	28.65	30.07	+.10	51.3	−4.7	80	23	62	23	1	41	37	43	36	63	1.07	−2.8	9	8,280	s.	37	nw.	24	14	9	7	4.2	0.0	0.0
Iola	984	11	50	28.98	30.05	+.10	50.3	−5.9	85	17	61	20	1	40	40	----	----	----	2.70	−1.3	9	5,913	ne.	30	nw.	24	13	7	10	5.0	0.0	0.0
Topeka	987	92	107	----	----	----	49.6	−5.1	89	17	60	17	3	39	41	----	----	----	2.71	0.0	8	7,059	sw.	48	nw.	24	12	9	9	4.7	10.0	0.0
Drexel	1,299	10	54	28.65	30.06	----	48.4	----	89	30	61	17	3	36	43	----	----	----	0.66	----	4	8,608	s.	40	sw.	30	11	10	9	5.2	T.	0.0
Lincoln	1,189	11	84	28.78	30.06	+.12	49.5	−2.0	88	30	62	22	3	37	44	40	29	51	0.36	−2.4	4	8,111	s.	60	nw.	24	11	8	11	5.5	T.	0.0
Omaha	1,105	115	122	28.86	30.06	+.11	50.0	−1.2	90	30	62	23	5	38	37	40	28	49	0.41	−2.6	4	6,574	ne.	48	nw.	24	14	12	4	4.3	0.1	0.0
Valentine	2,598	47	54	27.31	30.06	+.12	46.6	+0.9	90	30	60	16	3	33	50	37	26	53	0.39	−1.9	6	7,246	n.	39	nw.	23	12	10	8	4.7	3.8	0.0
Sioux City	1,135	94	164	28.84	30.07	+.12	48.6	+0.8	90	30	61	18	1	36	45	38	26	48	0.33	−2.4	4	8,668	n.	50	nw.	24	12	12	6	4.4	0.3	0.0
Huron	1,306	59	74	28.66	30.08	+.12	46.1	+1.0	91	30	61	7	5	31	56	36	24	47	0.09	−2.6	5	7,267	s.	42	nw.	24	16	8	6	3.6	0.8	0.0
Pierre	1,572	70	75	----	30.06	+.11	49.1	+2.3	92	29	63	14	5	35	53	----	----	47	0.15	−1.8	3	7,531	nw.	46	e.	17	13	7	10	----	1.5	0.0
Yankton	1,233	49	57	28.73	30.06	+.11	48.4	+0.5	93	30	63	16	2	34	48	----	----	----	0.20	−2.6	4	6,301	nw.	38	nw.	24	11	13	6	5.0	T.	0.0

TABLE 1.—*Climatological data for Weather Bureau stations, April, 1926*—Continued

Districts and stations	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max. +2 mean min.	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer	Mean temperature of the dew point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with .01, or more	Wind: Total movement	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
	Ft.	Ft.	Ft.	In.	In.	In.	°F.	°F.	°F.		°F.	°F.		°F.	°F.	°F.	°F.	%	In.	In.		Miles							0–10	In.	In.
Northern Slope							45.8	+2.6										57	0.60	−1.0									4.5		
Billings	3,140	5					47.3		87	29	64	6	1	31	51				0.42		4		nw.				14	5	11			
Havre	2,505	11	44	27.38	30.04	+.11	45.8	+2.1	87	29	61	7	6	30	49	37	27	57	0.12	−0.9	4	5,660	e.	38	sw.	20	19	10	1	3.1	0.5	0.0
Helena	4,110	87	112	25.81	30.02	+.05	46.6	+3.1	81	29	59	12	2	34	38	38	30	59	0.50	−0.6	7	5,713	sw.	30	sw.	22	10	9	11	5.4	8.1	0.0
Kalispell	2,973	48	56	26.92	29.98	+.02	47.2	+3.6	80	15	60	15	2	35	42	38	28	53	0.21	−0.8	3	5,112	nw.	30	nw.	22	16	11	3	3.6	0.8	0.0
Miles City	2,371	48	55	27.51	30.08	+.12	48.6	+3.9	90	30	62	14	3	35	42	38	28	54	0.27	−0.9	5	5,291	nw.	40	nw.	23	15	10	5	3.7	2.6	0.0
Rapid City	3,259	50	58	26.63	30.07	+.12	46.4	+2.1	85	29	58	17	5	34	46	37	26	49	0.32	−2.0	5	6,808	se.	36	nw.	13	13	6	11	4.9	3.2	0.0
Cheyenne	6,088	84	101	23.99	30.01	+.10	42.1	+1.2	72	30	54	12	1	30	36	35	28	64	1.27	−0.6	11	8,105	n.	40	nw.	23	8	9	13	5.7	4.8	0.0
Lander	5,372	60	68	24.64	30.00	+.06	46.6	+4.2	76	29	59	13	2	34	39	38	30	59	0.73	−1.7	11	3,438	e.	28	nw.	26	11	15	4	4.6	1.3	0.0
Sheridan	3,790	10	47	26.12	30.04		45.8		84	30	60	15	2	32	46	37	27	56	0.45		7	4,204	nw.	30	nw.	23	12	11	7	4.9	4.0	0.0
Yellowstone Park	6,241	11	48	23.88	30.02	+.05	40.6	+3.6	73	29	54	2	1	27	39	33	25	62	1.38	0.0	8	4,272	s.	27	w.	30	11	14	5	4.6	14.5	0.0
North Platte	2,821	11	51	27.12	30.08	+.16	48.2	−0.4	89	30	62	20	3	35	51	38	28	56	0.56	−1.6	4	5,905	n.	33	nw.	24	14	5	11	4.6	3.3	0.0
Middle Slope							49.9	−3.5										64	1.62	−0.6									5.0		
Denver	5,292	106	113	24.73	30.01	+.11	47.6	+0.5	76	30	59	18	2	37	36	39	30	59	2.31	+0.1	11	5,462	s.	36	se.	18	10	9	11	5.3	4.2	0.0
Pueblo	4,685	80	86	25.29	29.99	+.11	48.8	−1.3	79	26	61	20	2	36	39	39	31	60	0.94	−0.5	8	4,496	se.	29	nw.	13	12	7	11	5.6	1.4	0.0
Concordia	1,392	50	58	28.57	30.06	+.13	49.6	−3.9	90	17	61	20	3	38	42	41	31	57	1.00	−1.4	7	6,505	s.	42	nw.	4	12	8	10	4.8	7.4	0.0
Dodge City	2,509	11	51	27.45	30.08	+.18	48.2	−5.4	85	16	60	16	3	36	43	40	34	69	1.17	−0.7	9	7,286	ne.	32	nw.	23	17	3	10	4.2	2.1	0.0
Wichita	1,358	139	158	28.60	30.04	+.11	50.3	−6.1	82	16	61	22	3	40	40	43	36	66	1.64	−1.0	9	9,786	s.	42	ne.	27	14	6	10	4.8	0.0	0.0
Broken Arrow	765	11	56	29.20	30.03		54.0		84	23	65	28	3	43	39				1.63		6	9,887	n.	46	nw.	23	13	6	11	5.0	0.0	0.0
Oklahoma City	1,214	10	47	28.75	30.04	+.12	54.9	−4.9	86	23	66	27	3	44	37	47	42	70	2.66	−0.1	7	7,815	n.	31	s.	1	14	7	9	5.1	0.0	0.0
Southern Slope							57.4	−5.2										63	2.78	+1.1									4.9		
Abilene	1,738	10	52	28.20	30.01	+.11	57.6	−6.8	90	23	70	35	3	49	35	51	46	67	3.86	+1.6	7	7,587	s.	40	s.	1	10	6	14	5.6	0.0	0.0
Amarillo	3,676	10	49	26.28	30.02	+.15	51.0	−4.8	80	26	62	23	2	40	38	43	36	65	3.74	+2.0	5	7,743	n.	33	n.	27	13	8	9	4.8	7.9	0.0
Del Rio	944	64	71	29.00	29.98	+.09	66.6	−4.0	92	22	76	45	16	57	30				2.66	+0.7	11	6,700	se.	42	se.	20	8	11	11	5.5	0.0	0.0
Roswell	3,566	75	85	26.35	29.95	+.10	55.6	−5.0	86	23	68	33	15	43	38	46	35	56	0.86	0.0	4	6,183	s.	37	w.	6	15	12	3	3.7	0.0	0.0
Southern Plateau							58.9	+1.6										58	1.18	+0.8									4.2		
El Paso	3,778	152	175	26.17	29.94	+.11	60.7	−2.7	85	23	71	42	15	50	27	48	35	46	1.11	+0.9	7	6,246	w.	42	w.	6	15	12	3	3.7	0.0	0.0
Santa Fe	7,013	38	53	23.22	29.93	+.09	46.6	−0.1	70	23	57	29	12	36	32	38	30	62	0.82	0.0	12	4,632	se.	31	se.	19	8	10	12	6.0	T.	0.0
Flagstaff	6,907	10	59	23.32	29.89	+.05	44.0	+1.8	70	25	54	28	9	34	35	37		76	3.18		20	4,744	w.	20	s.	5	6	8	16		T.	0.0
Phoenix	1,108	10	82	28.75	29.90	+.03	68.6	+1.6	96	24	80	49	9	57	35	56	47	54	3.36	+2.9	13	3,641	e.	42	sw.	8	8	11	11	4.9	0.0	0.0
Yuma	141	9	54	29.72	29.87	−.02	72.7	+3.2	105	25	87	50	4	59	43	59	49	50	0.44	+0.3	3	3,667	w.	31	n.	28	20	10	0	2.3	0.0	0.0
Independence	3,957	5	25	25.90	29.90	.00	60.8	+5.7	88	26	76	32	3	46	38	46			0.18	0.0	5		nw.				12	8	10	4.2	0.0	0.0
Middle Plateau							53.6	+5.2										55	1.32	+0.3									5.0		
Reno	4,532	74	81	25.42	29.91	−.06	54.3	+7.0	82	28	68	30	2	41	40	43	34	55	0.44	0.0	8	4,790	w.	38	w.	2	12	8	10	5.0	0.0	0.0
Tonopah	6,090	12	20				52.2		75	26	62	33	3	43	27	41	32	53	0.50		8		se.									
Winnemucca	4,344	18	56	25.58	29.95	−.01	52.6	+5.9	84	29	68	20	2	37	46	43	34	59	1.07	+0.2	8	4,681	ne.	35	s.	7	11	14	5	4.4	0.0	0.0
Modena	5,479	10	43	24.58	29.90	+.02	49.4	+3.4	75	25	63	28	4	36	41	40	32	60	2.35	+1.6	11	7,022	sw.	42	sw.	7	11	8	11	5.3	0.0	0.0
Salt Lake City	4,360	163	203	25.58	29.93	+.01	55.3	+5.7	76	29	64	30	2	46	28	44	34	51	1.61	−0.6	10	5,435	nw.	38	se.	17	14	4	12	4.9	0.8	0.0
Grand Junction	4,602	60	68	25.33	29.90	+.02	56.2	+3.8	79	26	68	29	1	44	35	44	34	54	1.11	+0.4	9	4,176	se.	34	s.	18	10	10	10	5.5	1.0	0.0
Northern Plateau							55.3	+5.9										56	0.72	−0.6									4.5		
Baker	3,471	48	53		30.00	.00	51.1	+5.9	83	29	65	20	2	37	43			66	0.57	−0.4	6	4,552	se.	26	s.	1	13	9	8		2.0	0.0
Boise	2,739	78	86	27.13	29.98	.00	56.6	+6.2	88	29	69	27	2	44	36	46	36	52	1.09	−0.1	8	3,360	se.	24	ne.	10	15	8	7	3.9	2.2	0.0
Lewiston	757	40	48	29.18	29.99	.00	58.7	+5.8	93	29	73	34	7	44	44				0.35	−0.8	5	2,425	e.	24	n.	1	12	11	7	4.8	0.0	0.0
Pocatello	4,477	60	68	25.43	29.94	.00	51.9	+5.9	82	29	64	16	1	39	38	42	32	54	0.90	−1.1	8	5,339	se.	28	se.	18	10	11	9	4.9	0.1	0.0
Spokane	1,929	101	110	27.94	29.99	.00	54.0	+5.6	90	29	67	26	2	41	41	44	33	54	0.90	−0.2	7	4,256	ne.	24	sw.	29	13	11	6	4.7	3.8	0.0
Walla Walla	901	57	65	28.90	29.97	−.04	59.3	+6.2	93	29	71	33	2	48	35	49	39	53	0.53	−1.2	7	2,978	sw.	22	sw.	29	14	12	4	4.0	0.0	0.0
North Pacific Coast Region							55.9	+6.8										71	1.39	−1.8									5.5		
North Head	211	11	56	29.77	30.00	−.05	53.4	+5.9	74	24	58	42	4	49	24	49	46	80	1.50	−1.7	10	10,307	n.	63	s.	19	5	10	15	6.9	0.0	0.0
Port Angeles	29	8	53		30.01		50.3		71	26	59	35	6	42	27				0.58	−1.4	8	4,463	sw.	30	ne.	2	7	14	9		0.0	0.0
Seattle	125	215	250	29.85	29.98	−.05	55.8	+6.4	85	14	64	40	4	47	36	49	42	66	1.00	−1.4	10	5,762	n.	39	sw.	18	11	9	10	5.0	T.	0.0
Tacoma	194	172	201	29.78	29.98	−.05	55.4	+6.7	84	14	64	37	4	46	36				1.42	−1.4	8	5,343	n.	27	s.	19	9	17	4	4.9	0.0	0.0
Tatoosh Island	86	9	53	29.89	29.98	−.02	51.2	+5.1	63	7	56	40	3	47	15	48	46	84	3.11	−3.2	12	9,919	e.	59	e.	7	7	8	15	6.6	0.0	0.0
Yakima	1,071	5					56.7		94	28	74	23	4	40	52				0.05		3		nw.				5	19	6	5.4	T.	0.0
Medford	1,425	4					59.0		96	28	76	31	2	43	50	50	44	68	0.57		8		nw.				10	4	16		0.0	0.0
Portland, Oreg	153	68	106	29.81	29.97	−.09	60.2	+5.4	93	27	70	41	4	50	36	52	44	61	0.80	−2.2	7	3,863	nw.	27	e.	7	9	8	13	5.9	0.0	0.0
Roseburg	510	9	57	29.43	29.97	−.10	59.4	+8.4	96	27	73	36	23	46	48	52	46	69	1.29	−1.2	12	2,200	nw.	26	sw.	7	15	9	6	3.9	0.0	0.0
Middle Pacific Coast Region							60.2	+5.3										75	3.61	+1.4									5.2		
Eureka	62	73	89	29.93	30.00	−.11	54.8	+4.9	69	7	60	45	21	50	20	52	49	82	0.94	−3.0	11	4,466	n.	31	s.	7	6	10	14	6.9	0.0	0.0
Point Reyes	490	7	18	29.40	29.92		54.9	+4.3	77	25	59	47	18	51	26				3.32		9	14,522	nw.	73	s.	7	8	6	16	6.5	0.0	0.0
Red Bluff	332	50	56	29.57	29.92	−.11	64.5	+5.5	98	25	76	45	1	54	39	57	52	69	4.70	+2.8	7	4,157	se.	38	se.	7	17	8	5	3.9	0.0	0.0
Sacramento	69	106	117	29.85	29.92	−.09	63.0	+4.9	91	26	72	46	1	54	29	57	53	73	4.25	+2.2	7	5,440	se.	36	se.	7	17	5	8	3.9	0.0	0.0
San Francisco	155	208	243	29.79	29.96	−.09	61.6	+6.6	80	25	68	52	4	55	29	55	51	77	5.26	+3.4	9	6,253	w.	41	se.	7	12	8	10	5.2	0.0	0.0
San Jose	141	12	110	29.82	29.97		62.2	+5.5	92	25	72	45	21	52	39				2.88	+1.8	8	4,931	nw.	36	se.	7	12	6	12	5.1	0.0	0.0
South Pacific Coast Region							63.6	+5.2										75	5.28	+4.2									5.5		
Fresno	327	89	98	29.59	29.94	−.05	66.0	+5.8	98	26	77	47	9	55	34	56	48	59	3.90	+3.2	6	5,022	nw.	34	s.	7	17	3	10	4.4	0.0	0.0
Los Angeles	338	159	191	29.60	29.96	−.03	63.4	+4.0	83	24	70	52	9	56	26	58	56	83	7.53	+6.4	9	3,909	sw.	26	se.	5	6	10	14	6.3	0.0	0.0
San Diego	87	62	70	29.87	29.96	−.03	63.4	+4.9	71	28	68	54	9	59	14	59	57	83	5.37	+4.6	9	5,606	s.	37	s.	7	7	9	14	6.5	0.0	0.0
San Luis Obispo	201	32	40	29.77	29.98	−.07	61.8	+6.0	94	25	71	45	1	52	39	55	51	75	4.31	+2.8	12	3,757	nw.	27	s.	7	13	6	11	4.7	0.0	0.0
West Indies																																
San Juan, P. R.	82	9	54	29.94	30.03		77.6	+1.0	88	17	83	70	6	72	16				2.81	−1.0	15	8,721	e.	36	e.	10	17	11	2	3.8	0.0	0.0
Panama Canal																																
Balboa Heights	118	7	97	29.74	29.87	+.02	83.0	+1.4	94	3	91	71	6	75	20	74	72	78	0.08	−2.6	1	9,082	nw.	31	n.	24	0	21	9	6.9	0.0	0.0
Colon	38	7	97	29.85	29.89	+.02	82.9	+1.8	89	12	87	75	1	79	13	77	75	83	0.34	−4.0	10	10,166	n.	25	n.	21	0	10	20	8.3	0.0	0.0
Alaska																																
Juneau	80	11	54				43.8		55	25	48	31	4	39	16	41	37	79	7.62		22	5,525	s.	35	e.	4	5	0	25	8.2	0.0	0.0
Hawaiian Islands																																
Honolulu	38	86	100				72.0		82	25	77	60	5	67	14	64	59	65	0.74	−1.4	6	6,750	ne.	29	e.	13	5	20	5	5.4	0.0	0.0

TABLE 2.—*Data furnished by the Canadian meteorological service, April, 1926*

Stations	Altitude above mean sea level, Jan. 1, 1919	Pressure			Temperature of the air						Precipitation		
		Station reduced to mean of 24 hours	Sea level reduced to mean of 24 hours	Departure from normal	Mean max.+ mean min.÷2	Departure from normal	Mean maximum	Mean minimum	Highest	Lowest	Total	Departure from normal	Total snowfall
	Feet	*In.*	*In.*	*In.*	*°F.*	*°F.*	*°F.*	*°F.*	*°F.*	*°F.*	*In.*	*In.*	*In.*
St. Johns, N. F.	125												
Sydney, C. B. I.	48	29.73	29.78	−0.11	33.1	−1.9	41.0	25.3	58	14	4.62	+0.77	20.0
Halifax, N. S.	88	29.70	29.81	−.15	36.6	−1.2	44.7	28.6	59	16	4.81	+0.63	13.5
Yarmouth, N. S.	65	29.72	29.79	−.17	36.9	−2.0	43.2	30.7	62	22	4.16	+0.77	14.9
Charlottetown, P. E. I.	38	29.71	29.75	−.15	32.7	−2.5	38.9	26.6	52	12	3.09	+0.44	20.7
Chatham, N. B.	28	29.68	29.71	−.19	31.4	−4.1	40.4	22.5	53	4	3.94	+1.31	22.6
Father Point Que.	20	29.78	29.80	−.13	29.6	−3.6	35.4	23.8	46	10	1.49	−0.09	12.9
Quebec, Que.	296	29.53	29.86	−.13	31.4	−3.7	37.6	25.3	51	10	3.40	+1.31	21.9
Montreal, Que.	187	29.65	29.87	−.13	34.6	−5.1	41.2	28.0	64	14	2.49	+0.25	11.7
Stonecliffe, Ont.	489												
Ottawa, Ont.	236	29.63	29.91	−.11	34.6	−5.4	43.4	25.8	68	11	2.33	+0.83	17.1
Kingston, Ont.	285	29.60	29.92	−.10	35.3	−4.7	42.0	28.7	66	15	3.80	+2.01	15.5
Toronto, Ont.	379	29.53	29.95	−.07	37.3	−3.5	45.2	29.4	72	16	2.89	+0.52	4.6
Cochrane, Ont.	930				26.1		32.8	19.4	55	−1	0.52		5.2
White River, Ont.	1,244	28.59	29.94	−.10	24.3	−8.7	36.6	12.1	62	−17	1.94	+0.69	19.2
Port Stanley, Ont.	592												
Southampton, Ont.	656	29.23			31.9	−6.8	40.2	23.6	62	9	2.42	+0.62	17.4
Parry Sound, Ont.	688	29.23	29.94	−.08	30.9	−6.7	39.8	22.1	54	4	2.12	+0.21	10.4
Port Arthur, Ont.	644	29.26	29.99	−.04	31.5	−2.0	40.5	22.5	68	1	0.78	−0.94	5.2
Winnipeg, Man.	760	29.18	30.03	+.01	38.3	+2.2	49.8	26.4	80	12	0.16	−0.89	1.4
Minnedosa, Man.	1,690	28.18	30.04	+.03	36.2	+0.2	49.2	23.2	82	1	0.35	−0.71	1.2
Le Pas, Man.	860				31.4		43.6	19.2	71	0	0.58		4.0
Qu'Appelle, Sask.	2,115	27.70	29.97	−.02	39.4	+2.0	51.2	27.7	84	−2	1.43	+0.38	7.6
Medicine Hat, Alb.	2,144	27.67	29.94	+.02	47.9	+3.4	62.3	33.6	88	10	0.32	−0.42	0.2
Moose Jaw, Sask.	1,759				42.7		56.8	28.6	87	−9	0.35		0.6
Swift Current, Sask.	2,392	27.50	30.05	+.09	44.2	+2.9	59.4	29.1	82	2	0.13	−0.80	0.3
Calgary, Alb.	3,428												
Banff, Alb.	4,521	25.37	29.97	+.07	40.1	+4.8	55.1	25.2	77	−6	0.38	−0.70	1.2
Edmonton, Alb.	2,150	27.65	29.95	+.06	42.8	+2.9	55.9	29.7	80	0	0.32	−0.56	1.4
Prince Albert, Sask.	1,450	28.43	30.03	+.05	38.7	+2.6	52.8	24.7	80	−3	0.65	−0.18	0.1
Battleford, Sask.	1,592	28.25	30.00	+.03	42.5	+5.3	57.6	27.5	80	2	0.64	+0.17	0.2
Kamloops, B. C.	1,262												
Victoria, B. C.	230	29.74	29.99	−.02	53.4	+6.6	60.5	46.4	72	40	0.60	−1.77	0.0
Barkerville, B. C.	4,180												
Triangle Island, B. C.	680												
Prince Rupert, B. C.	170												
Hamilton, Ber.	151	29.97	30.13	+.08	66.0	+2.1	72.1	60.0	76	51	5.20	+1.02	0.0

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(Plotted by Wilfred P. Day)

(Plotted by Wilfred P. Day)

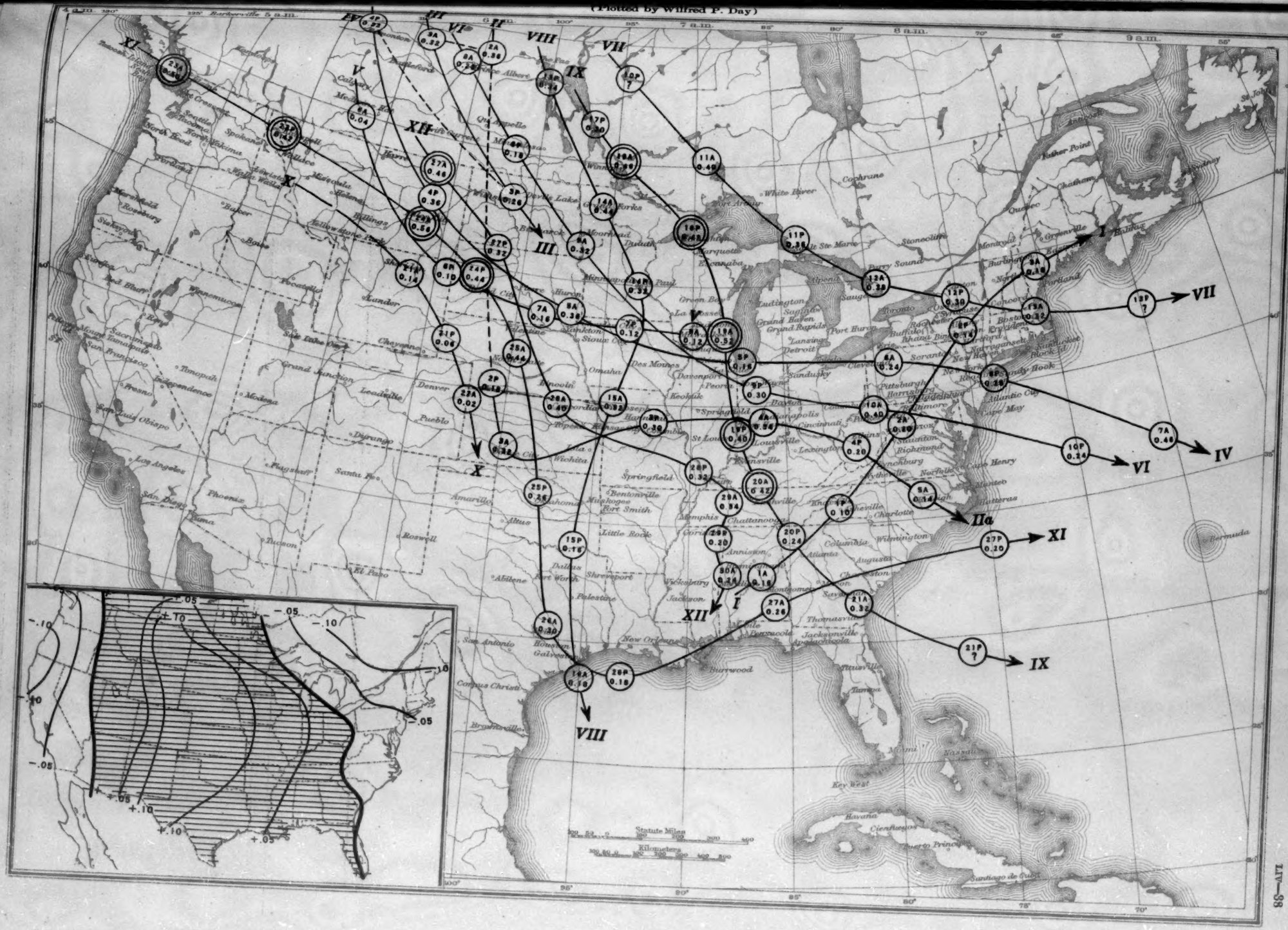


Chart II. Tracks of Centers of Cyclones, April, 1926. (Inset) **Change in Mean Pressure from Preceding Month**

(Plotted by Wilfred P. Day)

April, 1926. M. W. R.

Departures (°F.) of the Mean Temperature from the Normal, April, 1926

Departure of the Mean Temperature from the Normal, April, 1926

Shaded portions show excess (+).
Unshaded portions show deficiency (—).
Lines show amount of excess or deficiency.
Statute Miles
Kilometers

Chart IV. Total Precipitation, Inches, April, 1926. (Inset) Departure of Precipitation from Normal

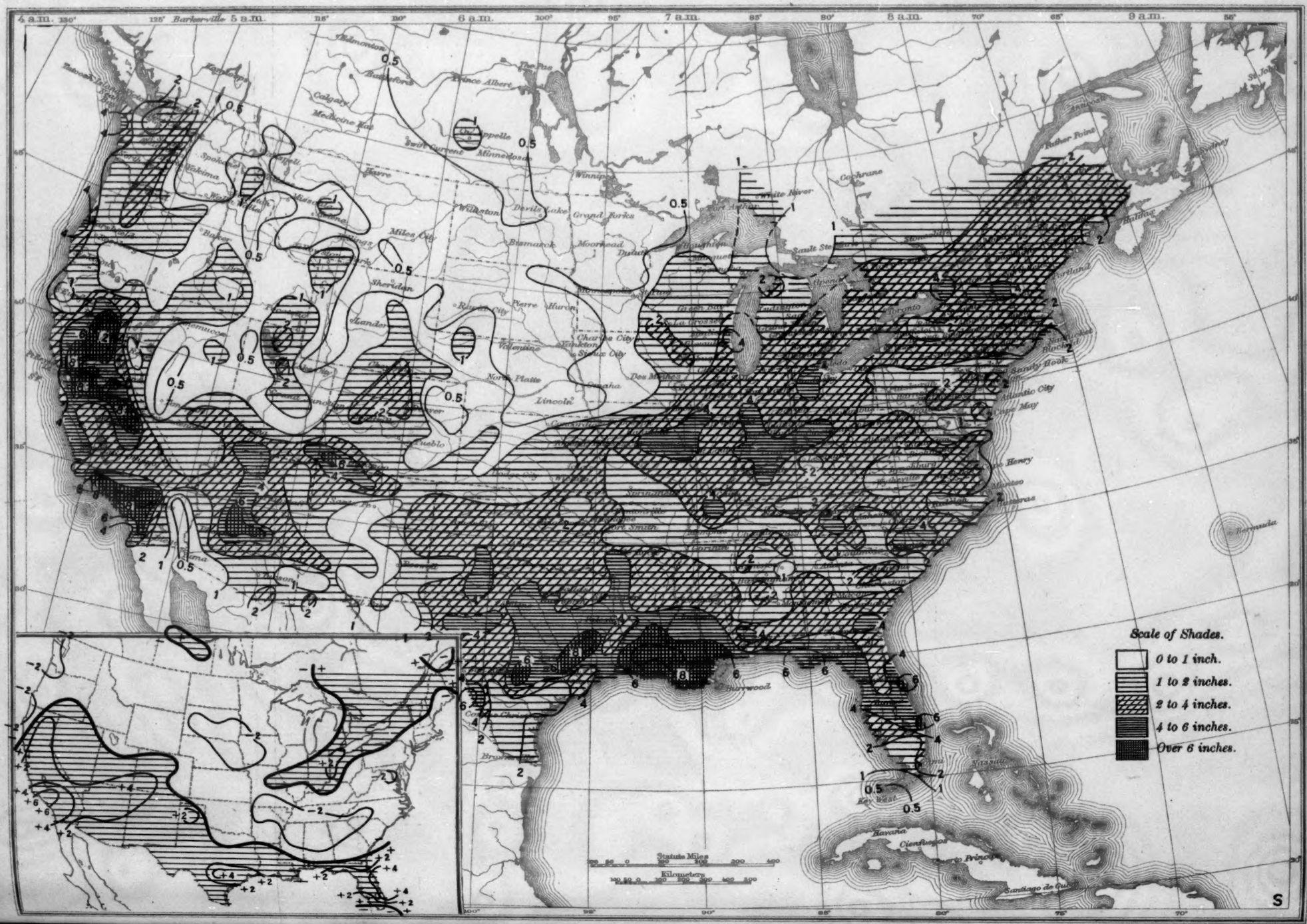


Chart V. Percentage of Clear Sky between Sunrise and Sunset, April, 1926

Chart V. Percentage of Clear Sky between Sunrise and Sunset, April, 1926

Chart VI. Isobars at Sea level and Isotherms at Surface; Prevailing Winds, April, 1926

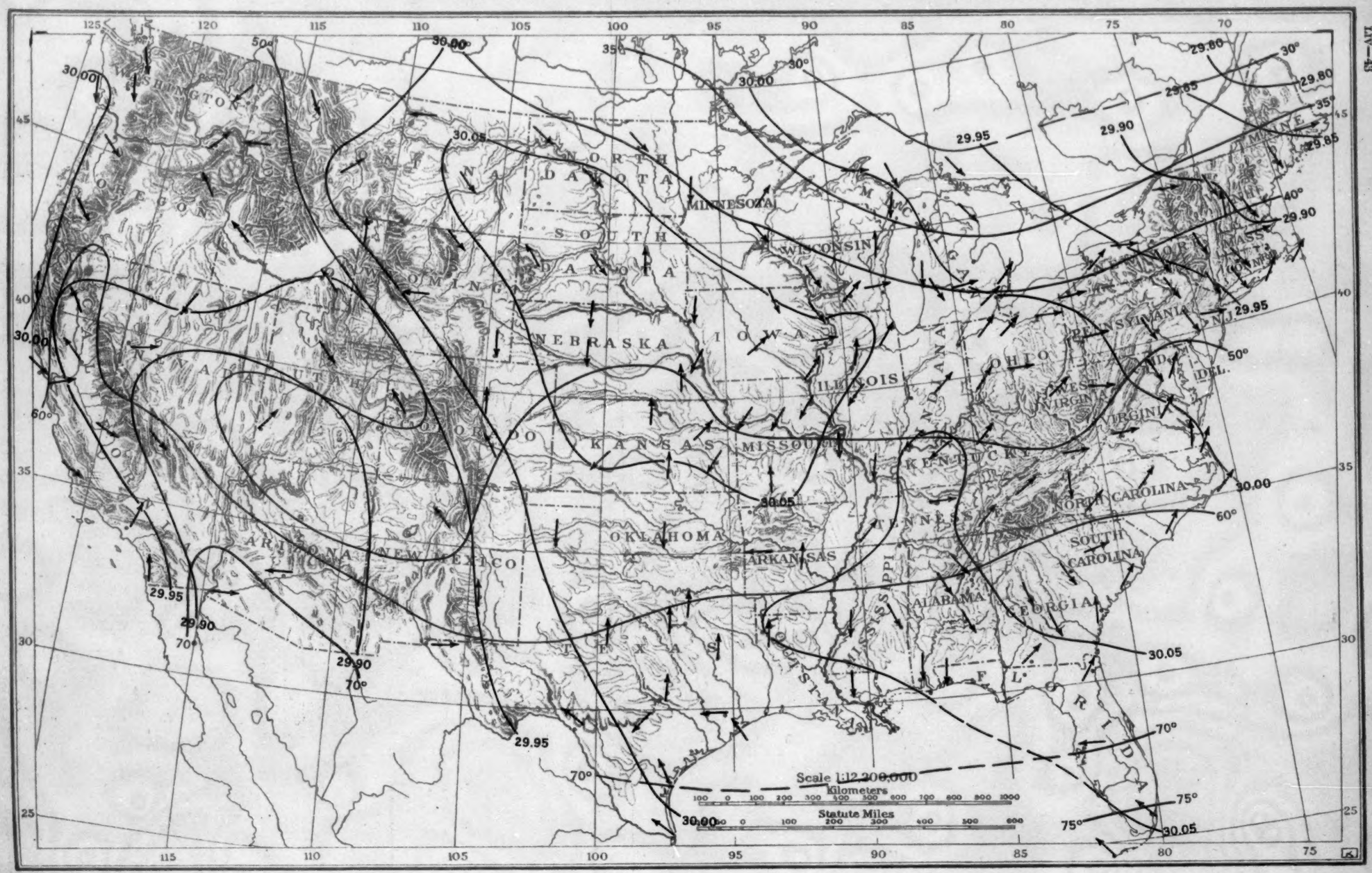


Chart VII. Total Snowfall, Inches, April, 1926.

Chart VII. Total Snowfall, Inches, April, 1926.

(Plotted by F. A. Young)

(Plotted by F. A. Young)

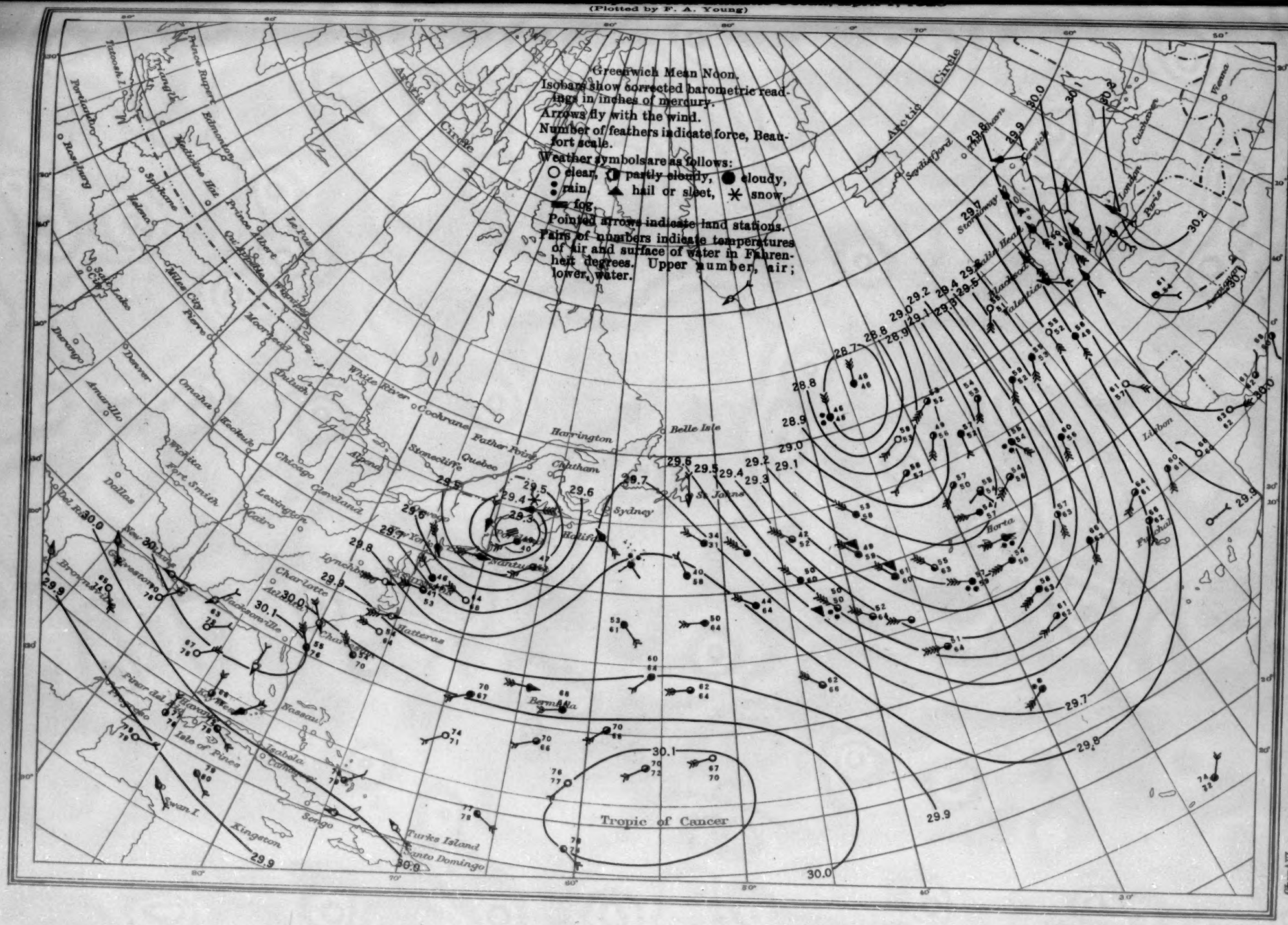
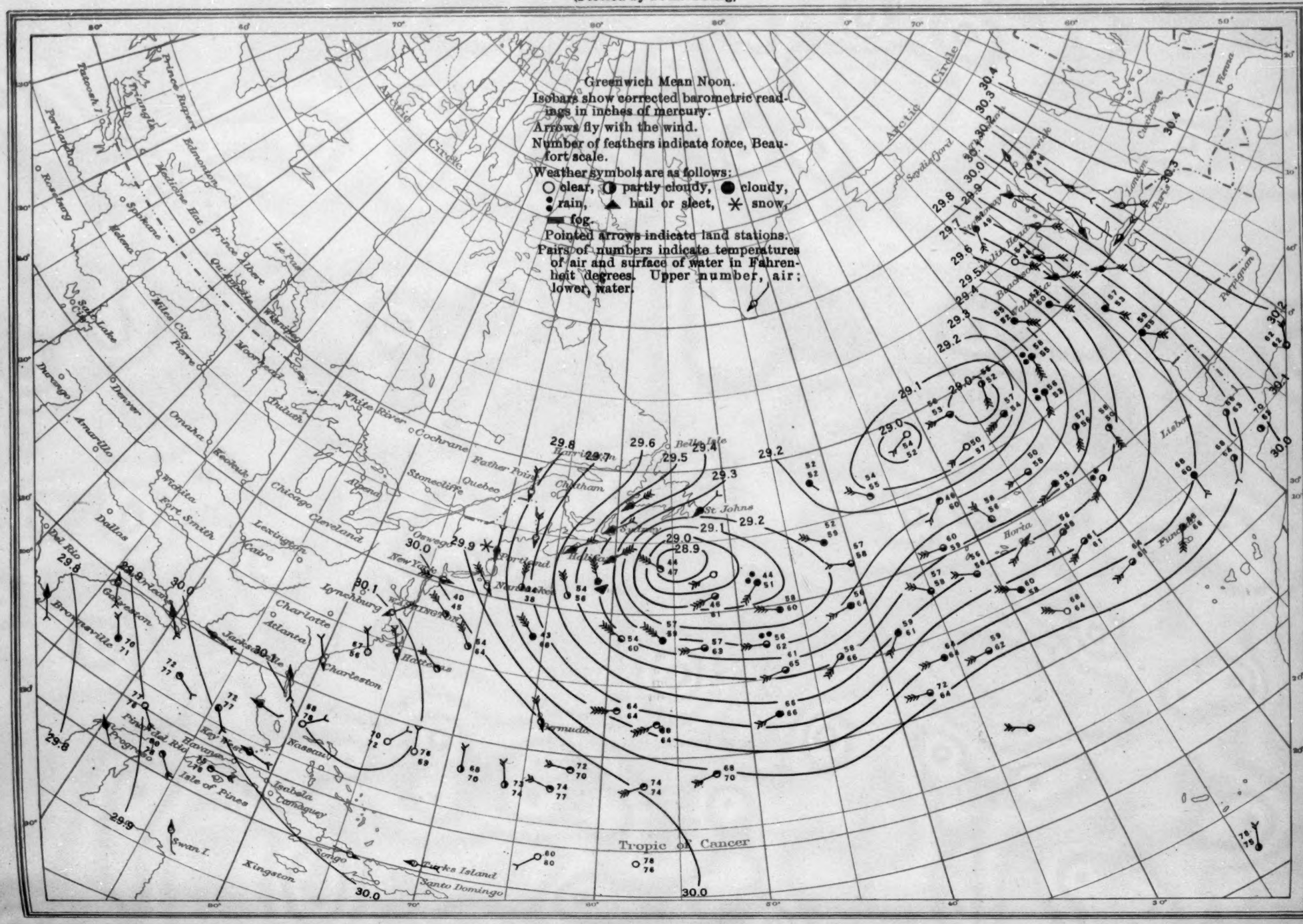

Greenwich Mean Noon.
Isobars show corrected barometric readings in inches of mercury.
Arrows fly with the wind.
Number of feathers indicate force, Beaufort scale.
Weather symbols are as follows:
clear, partly cloudy, cloudy,
rain, hail or sleet, snow,
fog.
Pointed arrows indicate land stations.
Pairs of numbers indicate temperatures of air and surface of water in Fahrenheit degrees. Upper number, air; lower, water.
Arctic Circle
Antarctic Circle
Tropic of Cancer
Prince Rupert
Edmonton
Medicine Hat
Swift Current
Prince Albert
Qu'Appelle
Winnipeg
Le Pas
Moosonee
Duluth
White River
Cochrane
Father Point
Quebec
Harrington
Belle Isle
Stonecliffe
Chatham
St. Johns
Sydney
Halifax
Yarmouth
Nantucket
Boston
Portland
Eastern Head
Sable Island
Hatteras
Bermuda
Nassau
Isabela
Cangrejos
Turks Island
Santo Domingo
Kingston
Swan I.
Isle of Pines
Key West
Havana
Progreso
Tampico
Galveston
New Orleans
Brownsville
Del Rio
Dallas
Fort Worth
Fort Smith
Wichita
Amarillo
Denver
Omaha
Keokuk
Chicago
Cleveland
Lexington
Cairo
Atlanta
Charlotte
Jacksonville
Lynchburg
Norfolk
Durango
Salt Lake City
Pierre
Roseburg
Portland
Tatoosh I.
Prince Rupert
Edmonton
Medicine Hat
Swift Current
Prince Albert
Winnipeg
Le Pas
Moosonee
Duluth
White River
Cochrane
Father Point
Quebec
Harrington
Belle Isle
Stonecliffe
Chatham
St. Johns
Sydney
Halifax
Yarmouth
Nantucket
Boston
Portland
Eastern Head
Sable Island
Hatteras
Bermuda
Nassau
Isabela
Cangrejos
Turks Island
Santo Domingo
Kingston
Swan I.
Isle of Pines
Key West
Havana
Progreso
Tampico
Galveston
New Orleans
Brownsville
Del Rio
Dallas
Fort Worth
Fort Smith
Wichita
Amarillo
Denver
Omaha
Keokuk
Chicago
Cleveland
Lexington
Cairo
Atlanta
Charlotte
Jacksonville
Lynchburg
Norfolk
Durango
Salt Lake City
Pierre
Roseburg
Portland
Tatoosh I.
Scatarie
Sydney
Belle Isle
Harrington
Father Point
Quebec
Cochrane
Stonecliffe
Chatham
St. Johns

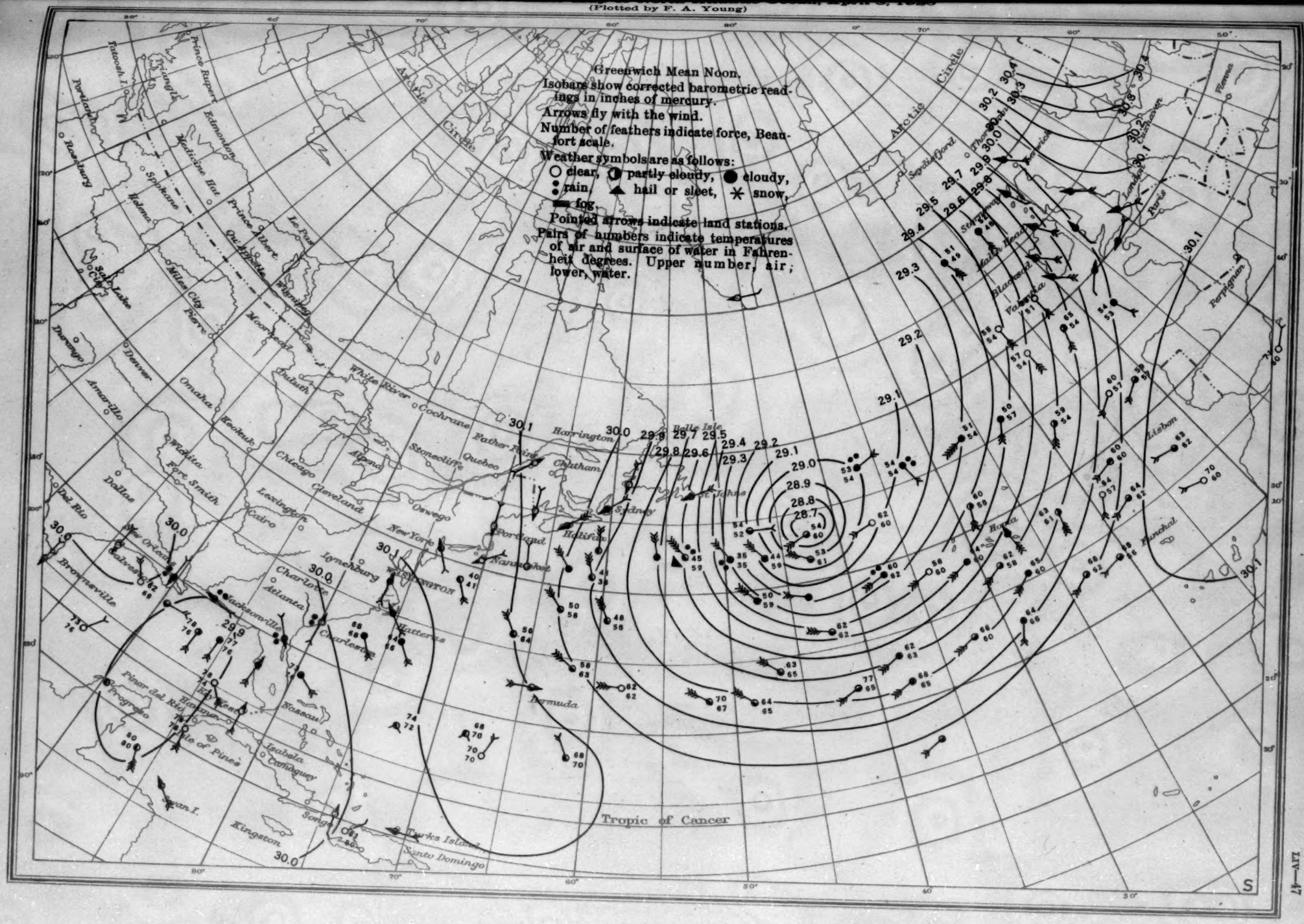
Chart IX. Weather Map of North Atlantic Ocean, April 2, 1926

(Plotted by F. A. Young)



(Plotted by F. A. Young)

(Plotted by F. A. Young)



April, 1926. M.W.R.

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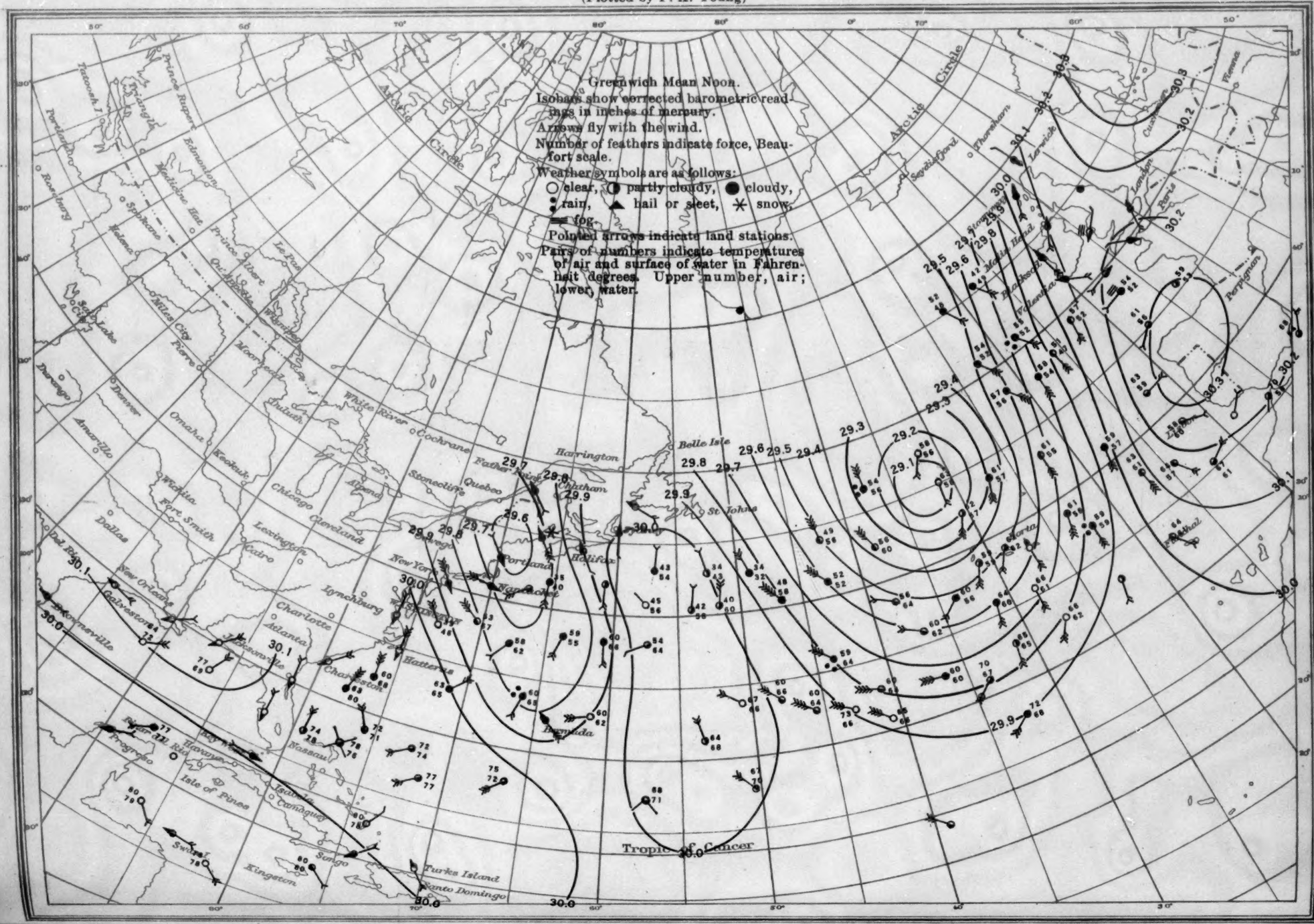
Chart XI. Weather Map of North Atlantic Ocean, April 4, 1926

(Plotted by F. A. Young)